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CONTENTS

Biological Notes on *Lethocerus americanus* (Leidy)
W. E. Hoffman 176
New Northeastern Dexinæ (Diptera; Tachinidæ)
L. S. West 184
New and Little Known Calyptrate Diptera from New England.
J. R. Malloch 193
Additions to the Phoridæ of Formosa.
C. T. Brues 206
On the Ant Genus Chrysapace Crawley.
W. M. Wheeler 224
Brief Diagnoses of Diptera Occuring in New England.
C. H. Curran 226
Notes on *Piesma cinera* Say.
G. W. Barber 229
Notes on *Piesma cinerea* Say in New Jersey (Hemiptera)
H. B. Weiss and R. B. Lott 233
More Notes on Fungus Insects and their Hosts
H. B. Weiss 236
Remarks on the Phylogeny and Interrelationships of Nematocerous Diptera.
G. C. Crampton 238
A New Bee from Oregon.
T. D. A. Cockerell 243
Proceedings of the Cambridge Entomological Club 245

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BIOLOGICAL NOTES ON *LETHOCERUS AMERICANUS* (LEIDY.)[1]

By William E. Hoffman.

University of Minnesota, St. Paul.

Although studied since 1847 when described by Leidy, very little has been written about the life history or habits of this "Electric-light Bug" or Giant Waterbug. This is rather surprising in view of the fact that its distribution is quite general and that it has been a favorite with biologists and naturalists for a long time, as evidenced by the many references to it in the literature. Its extreme voraciousness and the relation of this trait to fish culture is another reason for expecting that its life history might have been worked out.

In December of 1921 several specimens of this species were taken from their winter quarters by the writer. They were found near St. Paul in a small stream connecting two lakes. The water in this little stream of a hundred and fifty yards in length and about five yards in breadth, comes out of a long concrete conduit. As the water leaves the conduit it has considerable current but it becomes sluggish before it enters the lake. The current at this point, however, is sufficient to keep the water from freezing over during winter. The bugs were found under somewhat varying conditions. In the center of the stream they were found buried some five or six inches deep in the layer of disintergrated plant material forming the bed of the stream. The water at this point was over two feet deep. At the edge of the stream they were found among Typha roots. Here the water was but a few inches deep and the bugs were buried to a depth of

[1]Published with the approval of the Director as Paper No. 481 of the Journal Series of the Minnesota Agricultural Experiment Station.

two or three inches only. The bugs appeared to be dead when first taken but they soon responded to the warmth of the hands as shown by slight movements. They were placed in collecting cans and by the time we returned to the laboratory they were fairly active. Transferred to water of room temperature, in a short while they were as active as those taken during the warmer part of the year. They were kept in a glass vessel in the laboratory for a period of several months, but died before an aquarium suitable for the deposition of eggs was provided. During this period they received an occasional feed of small sunfish and small catfish.

On July first, 1923, a large Lethocerus nymph was secured from a small pond near University Farm campus. It was taken while dredging at the edge of a pond with a heavy water net. The nymph was feeding on a tadpole larger than itself and did not release its victim while it was being taken from the net and placed in a collecting can. In the laboratory it was placed in a glass vessel which was four inches deep and ten inches in diameter. This container was half filled with water and a little vegetation added. The nymph fed greedily upon beefsteak, grasshoppers, tadpoles, young frogs, young fish, flies and other things that were offered. On July fifth it molted. The cast skin measured dorsally as follows: Length along median line, 33 mm.; width of head across eyes, 6 mm.; width of posterior margin of prothorax, 10 mm.; width of posterior margin of metathorax, 14 mm.; width of abdomen across base of second segment, 16 mm. (widest portion of bug). Immediately upon molting it was of a very delicate yellow and green color and seemed quite frail. It was so translucent that it was easy to see what was going on within the bug. When observed a few hours later it had taken on the color it had previous to molting.

About seven hours after molting food was offered and it ate twelve large flies and two meadow grasshoppers. No doubt it it would have eaten more had they been offered. On the afternoon of the following day while out collecting, two tadpoles considerably larger than the nymph were secured, so one of these was offered. At the end of an hour nothing remained of the tadpole but the shriveled skin and some dark mud-like material

in the digestive tract. The second tadpole was then offered to the bug with the same result. I was curious to know how much more it might eat but refrained from offering more food as I still had a vivid recollection of what happened to a number of Ranatra that were allowed to gorge themselves. These bugs had had no food for several weeks and then one evening offered all the flies they could eat. The next morning eleven of the thirteen water scorpions were dead. It was at first thought there might have been something toxic about the flies and later the experiment was tried again. This resulted in the death of all five bugs used in the test. Still later the same experiment was tried again, this time using cockroaches and damsel-fly nymphs. Again all the bugs died. This food ordinarily is very fine for these bugs so evidently it was the effect of a large amount of food being taken after a fast which caused death. When they have been fed more regularly no evil effect seems to occur, even though they have all they can possibly consume.

On the thirteenth of July a move was made to the State Fish Hatchery at St. Peter, where some lake studies were to be conducted. Some anxiety was felt about successfully transporting the Lethocerus nymph, but it made the trip apparently none the worse for the experience. The trip was made by Ford, and this insect along with nymphs and adults of more than a dozen species of waterbugs, came through without mishap. The distance was only eighty-five miles but the life histories were "packed up" for about fifteen hours. Before packing for the trip the water was drained from the life history jars, leaving the bugs upon the wet sand.

In its new home the Belostomid was fed mostly on young trout. Two $3\frac{1}{2}$ inch trout were given every other day, with an occasional feed of grasshoppers, crickets and flies. It was fed trout principally, because the laboratory was located in a trout hatchery and trout became the most available food source. Every day the vegetation near the hatchery was "swept" for soft-bodied insects which were used as food for Velia, Microvelia, Gerrids, Nepa, Ranatra and other bugs in rearing. Grasshoppers and other large insects were often taken inadvertently and accordingly were given to the Lethocerus. The bug would refuse

to take food the day following a meal of two sizeable trout. This rather surpised me for I had always supposed Lethocerus would kill because of a vicious nature, whether hungry or not.

Adults likewise would not kill food excepting when they were hungry enough to eat what they killed. The adults did not feed as often as did the nymphs. It would be expected that the adults would not require as much food as the growing nymphs but this may not be the only reason for their smaller food requirement. There may exist here a condition found in the family Nepidæ. Nepa adults caught afield consistently eat less than the adults reared in the laboratory. Two factors perhaps are responsible in part or altogether for this condition. The food may not suit them as well as what they secure in nature, and they were probably used to receiving food less frequently in nature.

On the twentieth of July the nymph died. Since there was no indication of any unusual condition in the breeding jar it is believed the bug was ready to undergo another molt. As is true of insects in general the period of ecdysis is a critical one for waterbugs. That this mortality occurs at molting time in nature was evidenced by an examination of dead Microvelia nymphs taken afield. Measurements of dead nymphs of the several instars were made and found to correspond with those of the reared specimens just previous to molting time. In addition to this specimens were often found in which the skin had already split. It would be hard to determine whether the death rate is higher with insects reared in captivity or with those reared in nature. Hungerford (1919) in discussing the biology of the water boatman *Palmacorixa buenoi* Abbot remarked, "Under laboratory conditions, molting appears to be a precarious process." I found that to be the case with Ranatra, and it is especially true of the later instars. A number of specimens of three different species of Ranatra were isolated for rearing purposes, not one of which reached maturity.

At death the Lethocerus measured as follows: (all measurements dorsal): Length along median line 45 mm.; width of head across eyes, 5.5 mm.; width of posterior margin of prothorax, 13.5 mm.; width across extremities of mesothoracic wing pads,

20 mm.; width of abdomen across base of second segment, a fraction more than 20 mm.

That this nymph was of the last instar there can be no doubt as it was practically as large as some of the smaller adult Lethocerus in my collection. A comparison of the size and shape of the wing pads with those of a fifth instar *Belostoma flumineum* Say strengthens the opinion that such is the case. In the following discussion the next to the last and the last nymphal stages will be referred to as the fourth and fifth respectively, but for reasons to be given below, this may not be the proper designation.

The shape of the fourth and fifth instar nymphs is noticeably different. The widest measurement of the thorax in the fourth stage is the width through the hind angles of the metanotum (tips of rudimentary wing pads), which flare out slightly, while the greatest thoracic width of the fifth stage nymph is across the mesothoracic wing pads at a distance of about three millimeters before their tips. In the fourth stage the greatest abdominal width is two millimeters more than the greatest thoracic width. The mesothoracic wing pads lack about 1 mm. extending to the hind angles of the metanotum. These angles are not yet differentiated into wing pads. In the fifth instar nymph the greatest abdominal width is equal to the width across the tips of the mesothoracic wing pads, which now extend slightly beyond the hind angles of the metanotum. In this stage the hind angles of the metanotum are clearly differentiated into wing pads. The greatest width of the bug is now across the thorax instead of the abdomen. Our attention has been called to the disappearance of one of the anterior tarsal claws during the last molt. Another difference between nymph and adult is that the nymph has a dense growth of hair on the ventral side of the abdomen, while the same region in the adult is glabrous and devoid of hair.

Weed (1897) figures the "Last stage of nymph." This undoubtedly is a drawing of a fourth stage nymph. It does not agree with the specimen before the writer, in that the shape of the wing pads is different. However, it could not possibly be a last nymphal stage.

Since Belostoma has five nymphal stages it would be ex-

pected that Lethocerus would likewise have that number. This, however, does not necessarily follow, for in the Nepidæ we have a different number of instars in the different genera, Ranatra and Curicta having five, while Nepa has but four. Roesel (1755) figured five nymphal stages for the European *Nepa cinera* L. If we can accept as authentic these notes on the biology of *N. cinera*, we have this difference in the number of instars occurring within the genus. This is known to be the case in the family Veliidæ, where in the genus Microvelia we have some species with five instars while others have only four.

Since the fifth instar is of fifteen or more days duration it is evident that the growing period, the period of great food consumption, extends over a considerable period. The progeny of one or two pairs of adults could do a great deal of damage in a fish pond during their developmental period. The fish culturists are surely justified in their denunciation of this form as a menace to young fish.

Literature is replete with references pertaining to the ferociousness of this bug. A very remakable account of Lethocerus attacking a fish was recently related to the writer by Professor J. R. Parker of the University of Montana. His statement follows: "some time in September 1923, Mr. C. A. Morton of Bozeman with his family was camped on a small creek near Ovando, Montana. Early in the morning Mr. Morton and another man went out along the creek to get some fish for breakfast. In clear, still water they saw a trout about ten or twelve inches in length and while watching the trout they noticed a giant waterbug lying aimlessly on the surface of the water, except for one leg which it appeared to be waving in a manner to attract the attenton of the fish. It appeared to be successful in this for the trout grabbed the waterbug by the leg that had been moving whereupon the bug raised up and sunk its beak into the top of the fish's head. The trout began to swim excitedly in circles and jumped clear of the water several times. It finally turned over on its back. Mr. Morton waded out into the water and caught the fish to which the bug was still attached by its beak. He carried the fish back to camp and the bug did not release its hold until half way there. Mr. Morton

said there were so many skeletons of fish in this creek that they had hesitated to eat them, but after seeing this performance they no longer hesitated to eat them, thinking the waterbugs were the cause of the death of the fish. The stream was plentifully stocked with eastern brook trout and they had no trouble in getting a good string."

Lethocerus adults are strong fliers, and for this reason their distribution is quite general. Since these bugs are frequently taken at night it is likely they do most of their migrating at night. *Belostoma flumineum* Say, on the other hand is not taken at night. Leidy (1847) says both Lethocerus and Belostoma fly by night. In several years collecting the writer has never taken Belostoma at night although it has been taken on the wing during mid-day, far from any body of water.

Undoubtedly there is but one generation per year, although there is no assurance that the adults may not live over the second winter and lay eggs the second summer. If this were the case the potential damage of a pair of these bugs is indeed great. The writer would not be surprised to learn that many of the waterbugs produce eggs the second season. He now has specimens of *Velia watsoni* Drake which are over eighteen months old. These bugs produced eggs for a period of eight months last year and now after a winter rest of a few months, have again commenced laying eggs. There seems to be no reason why this species should not do the same in nature. It is true that in nature their food problem is not simple and enemies have to be reckoned with, but on the other hand they no doubt become inactive during the winter and perhaps age very little if any at this time. Those kept over winter in the laboratory (at room temperature) do not hibernate, consequently their greater activity probably shortens their lives. Further observations on this form are highly desirable.

The eggs of *Lethocerus americanus* Leidy have been searched for during the last two seasons but have not been found. The eggs of this species were first figured in 1868 (American Entomologist, Vol. I, pp. 61 and 62) as "The eggs of the Hellgrammite Fly." They were described as "oval, about the size of a radish seed, and of a pale color, with some dark markings. They are

usually deposited in a squarish patch upon reeds and other aquatic plants overhanging the water." This was an unsigned article, presumably written by the editors, Benjamin D. Walsh and Charles V. Riley. Very much the same account was published in the Fifth Missouri Report by Dr. Riley. The same figure was used but this time it was turned upside down. Packard in his "Guide to the Study of Insects" also published the account accompanied by the figure. Weed (1889) tells of finding a mass of Lethocerus eggs while collecting on the outskirts of Lansing, Michigan, July 3, 1882. He says, "I found a mass of eggs,..... beneath a board lying at the water's edge. The eggs gave evidence of having been freshly laid, and beside them was a living *Belostoma americanum*." In this connection an observation made by Professor Parker of Montana is of interest. He found giant waterbugs guarding their eggs on the bank of a small slough. His statement follows: "This was on June 11, 1921, at Ronan, Montana. The eggs were stuck to the grassy bank about a foot above the water. The slough was premanent, being one of the hundreds of pot-holes which dot the Flathead Indian Reservation. As I approached the eggs the male started for the water but was captured. The female assumed a fighting attitude with the front pair of legs extended and ready for action. Whenever anything was brought near her she struck viciously at it. Finally she was allowed to grab a stick and hung so tenaciously to this that I was able to shake her off into a cyanide bottle. The eggs were taken to Bozeman and hatched in the laboratory on the 15th of June. The young nymphs lived for about two weeks and then died." The writer has examined one of the adults and determined it as *Lethocerus americanus* Leidy.

Literature Cited.

Hungerford, H. B. 1919. The Biology and Ecology of Aquatic and Semiaquatic Hemiptera. Kansas Univ. Sci. Bull., vol. XI, pp. 1-341, 1919. (p. 223, says molting under laboratory conditions appears to be a precarious process.)

Leidy, Joseph. 1847. History and Anatomy of the Hemipterous Genus Belostoma. Journ. Acad. Sci. Philadelphia, pp. 57-67, plate x.

Packard, A. S. 1889. Guide to the Study of Insects. Ninth edition, 1889, p. 607, fig. 598.

Riley, C. V. 1873. Fifth Annual Report on the Noxious, Beneficial and other Insects of the State of Missouri, pp. 142-145.

Roesel, A. J. 1775. Der monatlich herausgegebenen Insecten-belustigung, dritter Theil, etc.

Weed, Clarence M. 1889. Bull. Ohio Agric. Expt. Sta., Tech. Ser., vol. 1., pp. 4-17.

1897. Life Histories of American Insects, pp. 4-7. (Fig. 2 shows "last stage of nymph.")

NEW NORTHEASTERN DEXIINÆ (DIPTERA; TACHINIDÆ).

By Luther S. West.

Department of Entomology, Cornell University, Ithaca, N. Y.

The following preliminary descriptions are offered at the present time in order that the species names may be included by Mr. C. W. Johnson in his "List of New England Diptera" soon to be published. Full descriptions, which have been in manuscript for some time, will be published in the author's Monograph of Northeastern Tachinidæ, now in process of preparation.

Ptilodexia neotibialis n. sp.

Male: Front, at narrowest part, one and one-half times width of ocellar triangle. No orbitals. Antennæ nearly half as long as face. Facial carina small. Vibrissæ distinctly above oral margin, one or two bristles above each. Proboscis rather slender, nearly as long as head height. Palpi reddish-brown. Beard dense, light in color. Sides of face bearing coarse, dark hairs. Thorax black, sprinkled with gray pollen. Dorsal vittæ usually 5, all indistinct. Post-suturals 3, sternopleurals usually 3, one stout and several lesser pteropleurals. Wings hyaline, venation not distinctive. Legs black. Adbomen black, the sides reddish. Chætotaxy variable. First segment usually with one pair of marginals, second with two or three pairs of discals and one pair of marginals, third with two or three pairs of discals and a marginal row, fourth segment densely clothed with spines. Length 14 mm.

Female: Front, at narrowest part, as wide as either eye. Orbitals present. Bristles of abdomen usually as follows;—first segment without macrochætæ, second with a discal and a marginal pair, third with a discal pair and a marginal row, fourth with a discal row and a marginal row.

Described from eleven male and five female specimens

from the following localities; Colebrook, Conn., two males, one female, (W. M. Wheeler); Cohasset, Mass., Sept. 15, 1904, one male, (Owen Bryant); Riverhead, L. I., one male, July 30, 1922, (H. C. Huckett); one female, Sept. 15, 1913; North Dakota, one male; Selden, L. I., two males, Aug. 10, 1916 and Sept. 1, 1916, (W. T. Davis); Great Falls, Fairfax Co., Va., one male, Sept. 9, 1914, (W. Robinson); Cincinnati, O., one male, Sept. 11, 1900; Albany, N. Y., one female, July 4, 1900; Fire Island, N. Y., one female Sept. 7, 1922, (W. T. Davis); Bright Angel Trail, Gd. Can., Ariz., one male; Black Canon, Cimarron, Colo., one female, Sept. 13-15, 1918, (R. C. Shannon).

Holotype, from Colebrook, Conn., deposited at Boston Society of Natural History, Allotype, from Albany, N. Y., retained at Ithaca. Paratypes at Boston, Ithaca, and N. Y. State Museum, at Albany.

Rhynochodexia confusa n. sp.

Male: Eyes nearly contiguous. No orbitals. Antennæ nearly three fourths as long as face. Carina fairly conspicuous, of the narrow-keel type. Vibrissæ slightly above oral margin. Ridges bristly less than one fourth their height. Proboscis three-fifths head height. Palpi yellow. Beard scanty, light in color. Sides of face bare. Thorax black, sprinkled with gray pollen. Three or five dorsal vittæ. Post-suturals 3 or 4, sternopleurals 3, rarely 2 or 4, pteropleurals in a tuft. Wings hyaline, no costal spine, third vein with 4 or 5 small bristles at the base. Legs yellow to dark brown. Abdomen covered with grayish pollen, the mid-dorsal region usually darker. Bristles of abdomen usually as follows;—second segment with four discals and two stout and two lesser marginals, third with three pairs of discals and a row of marginals, fourth bristly over entire surface. Length 8.5 to 13 mm.

Female: Front two-thirds as wide as either eye. Orbitals present. Abdominal chætotaxy less dense, in allotype as follows; second segment with one discal and one marginal pair, third with a discal pair and a marginal row, fourth with a discal and a marginal row.

Described from a long series of both sexes from the following localities: Selden, L. I., Baiting Hollow, L. I., Washington, D. C., Poughkeepsie, N. Y., Wood's Hole, Mass., Ithaca, N. Y., Lake George, N. Y., Luzerne Co., Pa., Colebrook, Conn., Fire Island, N. Y., Albany, N. Y., Nelson Co., Va., Lake Placid, N. Y., Lakehurst, N. J., Riverhead, L. I., McLean, N. Y., Ridgewood, N. J., Chester, Mass., Rutland, Mass., Bolton Mt., Vt., Durham, N. H., Tiverton, R. I., Keene Valley, N. Y., Nassau, N. Y., Wells, N. Y., Duck Lake, N. Y., Freeville, N. Y., Storrs, Conn.; July to September.

Flies answering the above description have been passing in collections for *Ptilodexia harpasa* Walk. That species however, as I know it, has the parafacials hairy, though similar in many other respects to this species. I have before me a long series of each, and I feel confident that distinction on the basis of bare or hairy face is well warranted. More thorough study, involving the examination of genitalia, may disclose as fact, what I now suspect; namely, that *more* than two species are here involved. I am however confident that the holotype and allotype of *R. confusa* belong together, and therefore feel justified in publishing the above description at the present time.

Holotype, male, Selden, L. I., July 1, 1923, allotype female, Baiting Hollow, L. I., Aug. 12, 1923. Both at Ithaca. Paratypes at Albany, Boston Society of Natural History, and in the collections of Messrs. Davis and Huckett.

Ateloglossa wheeleri n. sp.

Male: Appearance similar to *Sarcophaga*. Front twice width of ocellar triangle. No orbitals. Antennæ brown, half as long as face. Carina large, protruding. Vibrissæ slightly above oral margin, three or four small bristles above each. Proboscis half the head height. Palpi wanting. Beard light colored. Sides of face bare. Thorax and abdomen black to grayish pollinose. Dorsal vittæ 5. Post-suturals 4, sternopleurals 3, 1 stout and several lesser pteropleurals. Wings hyaline, no costal spine, apical cell closed and ending just before wing tip. Squamæ translucent-brown. First abdominal segment without mac-

rochætæ, second with one pair of marginals, third and fourth each with a marginal row. No abdominal discals. Length 8 mm.

Described from a single specimen collected by Professor W. M. Wheeler at Colebrook, Conn. Type is property of Boston Society of Natural History.

This species agrees with *A. cinera* Coq. in possessing marginal macrochætæ on the second abdominal segment, but differs in having the apical cell closed. It differs from *A. glabra* West MS in having the squamæ infuscated, and from *A. calyptrata* West MS in regard to the shape of the head, as well as in certain characters furnished by the bristles of the legs.

Arctophyto johnsoni n. sp.

Female: Appearance similar to *Sarcophaga*. Front as wide as either eye. Three pairs of orbitals. Antennæ yellow, half as long as face. Carina fairly large and conspicuous. Vibrissæ practically on level with oral margin. Facial ridges bristly on lowest fifth. Proboscis short and thick. Palpi yellow. Beard sparse, light colored. Thorax and abdomen dull grayish pollinose. Thoracic vittæ three, all indistinct. Post-suturals 4, sternopleurals 4, 1 stout pteropleural surrounded by a tuft of hairs. Wings hyaline, venation not distinctive. Legs dark, tibiæ tinged with yellow. First abdominal segment with one pair of marginals, second with a small pair of discals besides a marginal pair, third and fourth each with discals irregular, and a marginal row. Length 7 mm.

Described from a single specimen bearing the label Concord, Mass., Aug. 7, 1920. This specimen was loaned me by Mr. C. W. Johnson with the suggestion that it was probably "near *A. borealis* Coq." Type is property of Boston Society of Natural History.

Arctophyto regina n. sp.

Female: Similar to *A. johnsoni* but differing in the following respects: Front, at the narrowest part distinctly one third wider than either eye. Frontal vitta nowhere wider than either

side of front. Dorsal vittæ of thorax much more distinct, the two laterals much heavier than the median one. Sternopleurals three. Apical cell just closed in the margin; bend of fourth vein somewhat more angular. Length 8 mm.

Known only in the female. Described from a single specimen collected by Mr. C. W. Johnson from Brookline, Mass., Sept. 6, 1904. Type is property of Boston Society of Natural History.

Eutheresia montana n. sp

Male: Front twice width of ocellar triangle. No orbitals. Antennæ three-fifths as long as face, yellowish, the distal half darker. Arista short-plumose. Carina small and inconspicuous. Vibrissæ practically on level with oral margin. Facial ridges bristly nearly one-third their height. Proboscis one-third head height. Palpi yellow. Beard sparse, light colored. Eyes and sides of face bare. Thorax black, sprinkled with gray pollen, dorsal vittæ 5. Post-suturals 4, sternopleurals 2 or 3, 1 stout and several lesser pteropleurals. Wings hyaline, venation not distinctive. Legs dark brown to black. Abdomen black to reddish, sprinkled with gray pollen. First segment without macrochætæ, second with a marginal pair, third and fourth each with a marginal row. No abdominal discals. Length 8.5 mm.

Known only in the male. Described from a single specimen collected by A. P. Morse on Mount Mansfield, Vt., at an elevation of 4000 to 4450 feet, July 21, 1891. Specimen was secured from C. W. Johnson thru an exchange of material, and bore the designation *Eutheresiops* sp. That genus however is characterized as having hairy parafacials as well as hairy eyes, and cannot possibly be construed as including this species. Type at Ithaca.

Myiocera isolata n. sp.

Male: Head at vibrissæ as long as at base of antennæ, face about two-thirds height of head behind. No orbitals. Antennæ fully half as long as face. Carina very conspicuous,

broad, high, protruding. Vibrissæ distinctly above oral margin. Facial ridges bristly one-sixth their height. Proboscis shorter than head. Palpi brown. Beard sparse, light colored. Sides of face bare. Thorax black, sprinkled with gray pollen. Dorsal vittæ 3, all heavy. Post-suturals 3, sternopleurals 3, several stout and several lesser pteropleurals. Wings hyaline, venation not distinctive. Squamæ yellowish. Legs black. Hind tibiæ irregularly ciliate. First two visible segments of abdomen black, third reddish, fourth yellow, all with sprinkling of gray pollen. First without macrochætæ, second with one pair of marginals, third with a few discals and a marginal row, fourth covered with heavy bristles. Length 11.5 mm.

Described from a single specimen taken at Hanover, N. H. July 4, 1908. Type is property of Boston Society of Natural History.

Myiocera novae-angliae n. sp.

Female: Head at vibrissæ slightly longer than at base of antennæ. Front nearly as wide as either eye. Three pairs of orbitals. Carina prominent. Vibrissæ slightly above oral margin. Facial ridges bristly nearly one-third their height. Proboscis two-thirds head height. Palpi yellow. Beard sparse, light colored. Sides of face bare. Thorax black, sprinkled with gray pollen. Dorsal vittæ three, all heavy. Post-suturals 4, sternopleurals 2 or 3, pteropleurals usually 2 besides several lesser hairs. Wings hyaline, venation not distinctive. Squamæ white. Hind tibiæ not ciliate. Abdomen nearly as broad as long, black, save for apical two-thirds of last segment, which is yellow, the whole covered with a uniform sprinkling of grayish pollen. First segment without macrochætæ, second with a marginal pair, third and fourth each with a marginal row. Length 9 mm.

Male differs from female as follows: Front, at narrowest part scarcely wider than ocellar triangle. No orbitals. Pollen of face more golden. Sternopleurals three or four. Squamæ a trifle infuscated. Abdomen more elongate. Fourth abdominal segment almost wholly reddish-yellow and with several discal

macrochætæ besides the marginal row. Genital segments reddish.

Described from two specimens loaned the writer by Mr. C. W. Johnson. Holotype female, this specimen being in much the better condition; collected at Colebrook, Conn., by W. M. Wheeler. Allotype, male, collected by Mr. Johnson at Darien, Conn., June 16, 1909. Types are property of Boston Society of Natural History.

Myiocera protrudens n. sp.

Male: Large, robust flies. Head at vibrissæ as long as at base of antennæ. Face scarcely half height of head behind. Front twice width of ocellar triangle. No orbitals. Antennæ bright yellow, half as long as face or a little more. Carina very conspicuous, protruding between antennæ. Vibrissæ slightly above oral margin. Ridges bristly one-fifth their height. Proboscis about as long as head height. Palpi yellow. Thorax black sprinkled with gray pollen. Dorsal vittæ three, all heavy. Post-suturals 4, sternopleurals 3, 1 large and several lesser pteropleurals. Wings hyaline, venation not especially distinctive. Squamæ white. Legs black, hind tibiæ ciliate. Abdomen reddish black covered sparsely with grayish pollen. First segment without macrochætæ, second with or without a pair of marginals, third and fourth each with a marginal row. Length 14.5 mm.

Female differs from male as follows: Front, at narrowest part about as wide as either eye. Three pairs of orbitals. Ciliation of hind tibiæ not quite so even, nor extending quite so far. Described from one female and two male specimens, the first collected by Mr. C. W. Johnson from Sharon, Mass., Aug. 3, 1909. One of the males was collected by Mr. W. T. Davis from Newfoundland, N. J., July 6, 1908, the other is from Ringwood Hollow, near Ithaca, N. Y., July 5, 1920; collector unknown, probably M. D. Leonard.

Holotype male, (Ringwood specimen), retained at Ithaca. Allotype female, property of Boston Society of Natural History. Paratype in collection of W. T. Davis.

Dinera futilis n. sp. (Smith MS)

Male: Slender gadyish flies. Head at vibrissæ as long as at base of antennæ. Front to eye width as 10:19. No orbitals. Antennæ three-fourths as long as face. Carina prominent, bluntly keeled. Vibrissæ slightly above oral margin, one or two small bristles above each. Proboscis slender, as long as ventral length of head. Palpi pale yellow. Sides of face with a sparse covering of minute hairs. Thoracic vittæ two, indistinct. Post-suturals 3, (rarely 4), sternopleurals 3, 1 stout and several lesser pteropleurals. Wings hyaline, a pair of costal bristles present opposite termination of auxiliary vein. Apical cell varying from barely closed to open in the margin, ending just before wing tip. Legs yellow, certain joints brownish. First abdominal segment with a strong pair, a single bristle, a very weak pair, or no macrochætæ, second with a very stout pair, third and fourth each with a distinct marginal row. No abdominal discals. Tergites, except segment four, meeting in keel-like fashion on mid-ventral line. Length 6.5 mm.

Female differs as follows: Front, at narrowest part to eye-width as 17:13. Two pairs of orbitals. Parafacials sometimes more noticeably hairy. Inferior sternopleural sometimes lacking. Described from fifteen males and thirteen females from the following localities: Atco, N. J., one male, June 18, 1913; Brookings, S. D., one male, June 4, 1891; South West Harbor, Maine, one male, July 20, 1923 (Johnson); Needham, Mass., one male, Aug. 4, (A. P. Morse); Voorheesville, N. Y., one male, June 19, 1923 (M. D. Leonard); Baiting Hollow, L. I., two males, June 6, 1923, (H. C. Huckett), one male, Aug. 25, 1923 (H. C. H.); two females, July 29, 1923 (H. C. H.), one female, Aug. 29, 1923 (H. C. H.); Wading River, L. I., one male, Aug. 25, 1923 (H. C. H.); Intervale, N. H., one female, Sept. 4, 1707, (G. M. Allen); Ithaca, N. Y., one female, June 28, 1898, one female Aug. 4, 1885 (E. H. Sargent); Philadelphia, Pa., one female; Rochester Junction, N. Y., one female, July 24, 1914, (M. D. Leonard); Ft. Collins, Colo., one female; Wellesley, Mass., one female, (A. P. Morse); and six males and three females with no locality record. In addition to the above

localities, Mr. Johnson informs me that he has specimens recorded from Hampden, Me., July 10 (C. W. J.); from Wonalancet, N. H., Sept. 13, (Cushman); Jackson, N. H., Sept. 25, (Bryant); from Pelham, N. H., Aug. 31; from Danvers, Springfield, Nantucket, Brookline, and Auburndale, Mass.; June 29-Sept. 14; from Kingston, R. I., July 19 (Barlow); and from Westville, Conn., June 20 (Britton).

Dinera futilis is a manuscript name of H. E. Smith's which has come into use in lists and other records although the species has never been described. I have been asked by Mr. Johnson and others to publish this description, which I am pleased to do, using of course, the name by which the species has already come to be known. Our species is exceedingly close to that known in Europe as *Dinera grisescens* Fall., of which I have before me five males and three females, obtained from the Vienna Museum. The only superficial difference appears to be in a tendency for the yellowish cast, on mid-ventral line and along posterior margins of abdominal segments one, two and three, on ventral side, to be somewhat more pronounced in the European than in the American form. The variation in chætotaxy is the same for both species, but being loath to pronounce them the same, I relaxed two males of each series in order to examine the genitalia. The inner forceps of both are fused, but there are certain other very appreciable differences, which surely warrant keeping the two species separate. The fused inner forceps in *futilis* exhibit a low, narrow carina, and are clothed with dark hairs at the base. In *grisescens* this structure is totally devoid of a carina, and bares only pale hairs at the base.

Holotype, male, from Atco, N. J., retained at Ithaca. Allotype, female, from Intervale, N. H., deposited at Boston Society of Natural History. Paratypes at Ithaca, Boston and Albany.

Note: It is the author's intention to arrange, eventually, for the deposition of certain paratypes at the U. S. National Museum in Washington.

NEW AND LITTLE-KNOWN CALYPTRATE DIPTERA FROM NEW ENGLAND.

By J. R. Malloch.

Biological Survey, Washington, D. C.

The first three species belong to the family Scatophagidæ, the others to the Muscidæ (=Anthomyiidæ auct.).

Microprosopa flavinervis sp. nov.

Male.—Head yellow, interfrontalia more rufous; ocellar triangle and upper half of occiput fuscous, gray pruinescent; second antennal segment and arista yellow, third antennal segment black; palpi whitish yellow; vibrissæ and genal bristles luteous; orbital, vertical, and ocellar bristles black. Thorax black, densely gray pruinescent. Abdomen tawny, fuscous dorsally on basal half. Legs, including coxæ, yellow. Wings yellowish, veins yellow. Halteres yellow.

Upper three orbital bristles nearer eye than lower three, the second and third curved forward and outward, the lower three incurved; arista almost bare; vibrissæ duplicated; eye a little longer than high, slightly pear-shaped, the narrow extremity in front. Dorsocentral bristles rather short, two pairs in front of suture; scutellum with four equal bristles. First and fourth visible tergites longer than second and third, fifth a little longer than fourth, not extending to margin on left side; sixth tergite as long as fifth; hypopygium large, occupying nearly half of length of venter; processes of fifth sternite robust, obtusely pointed. Fore and mid tibiae each with a fine median anterodorsal bristle; hind femur without distinct anteroventral bristles; hind tibia with one posterodorsal and one or two anterodorsal bristles.

Length, 5 mm.

Type and paratype, Auburndale, Mass., May.

Orthochaeta dissimilis sp. nov.

Male and female.—Black, shining, thorax and abdomen with distinct gray pruinescence, most dense on pleura. Head black, face and anterior portion of interfrontalia reddish; face, frons, and cheeks with white pruinescence; antennæ and proboscis black; palpi yellow. Thoracic dorsum rather indistinctly trivittate. Abdomen black or yellowish brown. Legs yellow, coxæ slightly brownish at bases. Wings clear, more yellowish basally, veins yellow. Calyptræ white. Halteres yellow.

Frons slightly over one third of the head width, narrowed anteriorly; each orbit with about eight bristles; antennæ nearly as long as face, third segment broad, its apex with an acute upper angle; arista nearly bare, second segment in male about twice as long as thick, third very much swollen at base, rapidly becoming slender apically; arista of female with second segment shorter than in male, the third swollen on its basal third; cheek not over one tenth as high as eye, with about six long marginal bristles; vibrissæ long, one bristle above it; proboscis slender. Thorax with the same bristles as the genotype, except that there are but two scutellars present. Fifth abdominal sternite of male with two long processes which are slightly tapered apically, their tips rounded. Fore femur with several bristles in a series on anterodorsal surface, the one nearest apex much stronger than the others; fore tibia with one posteroventral, two posterodorsal, and two anterodorsal bristles; mid and hind femora each with several widely spaced bristles on anterodorsal, anteroventral, and posteroventral surfaces; mid tibia with the following bristles: one anteroventral, two anterodorsal, two posterodorsal, and one posterior; hind tibia with one anteroventral, three posterodorsal and three anterodorsal bristles. Costa with short black spinules; last section of veins 3 and 4 nearly parallel.

Length, 7.5—8.5 mm.

Type, Algonquin, Ill., June 3, 1898. Paratypes, Urbana, Ill., May 7, 1907; Great Falls, Va., May 10, 1915; Norfolk, Ct., May 21, 1916; Columbus, Ohio, May 7, 1902; and four specimens from the Osten Sacken Collection in the Museum of Comparative Zoology, taken in 1874, without legible locality labels.

Scatophaga monticola sp. nov.

Male.—Similar to *furcata* Say in color, the third antennal segment fuscous, palpi yellow; dorsum of thorax with four pale brown vittæ; apices of abdominal tergites narrowly black; legs yellow, fore femora with a darker stripe on posterodorsal surface; wing veins clouded, the apices of veins 2, 3, and 4 rather faintly so, both cross-veins with spot-like clouds.

Arista bare; palpi dilated. Thorax with 2+3 dorsocentral bristles which are very distinct because of their strength and the scarcity of dorsal hairs; pteropleura and hypopleura bare. Processes of fifth sternite long, tapered to a rounded point, their basal width less than half as great as their length, no short spines evident. All femora and tibiæ with rather dense erect ventral hairs the length of which does not noticeably exceed the diameter of the parts upon which they are situated; fore tibia with two anterodorsal and one fine posterior bristle: mid and hind femora without distinct ventral bristles; mid tibia with two or three anterodorsal and posterodorsal bristles; hind tibia with three anterodorsal and posterodorsal bristles, the anteroventral bristles usually indistinguishable.

Female.—Similar to the male in color but slightly darker. Abdomen pointed. Legs less hairy, the hind femora usually with one or two anteroventral bristles apically.

Length, 7 mm.

Type, male, allotype, and one female paratype, Mt. Washington, N. H.

The fifth sternite in male is similar to Figure 22, pl. 14, in my paper on the Pribilof Island Diptera[1], which is unfortunately mislabeled *furcata* instead of *islandica* and so referred to in the text. Figure 21 represents the fifth sternite in *furcata*.

The description herein presented is drawn from specimens in the U. S. National Museum collected by Mrs. A. T. Slosson and labeled *S. bicolor* Walker. I am confident that Walker's species is a synonym of *furcata* Say. These specimens were brought to my attention by Dr. J. M. Aldrich. The bare arista,

[1]North Amer. Fauna, No. 46, U. S. Dept. of Agri., Biol. Surv. 1923.

pteropleura, and hypopleura distinguish the species from its allies.

Hylemyia sinuata sp. nov.

Male.—Black, shining, thorax uniformly gray pruinescent, abdomen with gray pruinescence on sides of tergites, the dorsocentral black vitta very broad. Legs black. Wings hyaline, fuscous at extreme bases, veins black. Calyptræ whitish. Halteres yellow.

Eyes separated by a little more than width across posterior ocelli; orbits narrow, setulose to above middle; interfrontalia with one or two pairs of cruciate bristles; parafacial at base of antennæ wider than third antennal segment, much narrowed below; cheek about as high as greatest width of parafacial, with a single series of bristles below; third antennal segment about 1.5 as long as second; arista subnude; proboscis normal. Presutural acrostichals uniserial, sparse, long; prealar over half as long as the bristle behind it; sternopleurals 1:2. Abdomen short and stout, hypopygium rather large; processes of fifth sternite long and slender, their length along inner margin as great as that of basal two segments of hind tarsus, the inner margin of each sinuate and furnished at middle with a fringe of dense, short, stiff hairs, apex on inner side with a few short, fine hairs, the outer margin with some long bristles. Fore tiabi with an anterodorsal and a posterior bristle; fore tarsus as long as tibia; mid femur with a few bristles on basal half of anteroventral and posteroventral surfaces; mid tibia with two anteroventral, anterodorsal, posterodorsal, and posteroventral bristles; hind femur with a complete series of anteroventral, and some shorter posteroventral bristles on basal half; hind tibia with three or four anteroventral, anterodorsal, and posterodorsal bristles, and a few posterior setulæ. Outer cross-vein of wing almost straight.

Length, 4 mm.

Type, Newton, Mass., May 15, 1920 (C. W. Johnson).

The peculiar processes of fifth sternite separate this species from any other in the genus known to me.

Hylemyia longipalpis sp. nov.

Male—Black, slightly shining, densely gray pruinescent, the abdomen with a slight bluish tinge. Anterior margin of frons and of parafacials reddish; orbits, parafacials, face, and cheeks with silvery pruinescence; antennæ and palpi black. Thorax indistinctly vittate. Abdomen with a black dorsocentral vitta which is dilated at anterior and posterior margin of each segment. Legs black. Wings hyaline. Calyptræ white. Halteres brownish yellow.

Eyes separated by about the distance between posterior ocelli; orbits almost obliterating interfrontalia in front of ocelli; orbital bristles extending to middle interfrontalia with a weak pair of cruciate bristles; parafacials at base of antennæ as wide as third antennal segment; slightly narrowed below; cheek as high as widest part of parafacial, armed as in *flavifrons*; third antennal segment on inner side subequal in length to second; arista swollen on basal fourth, almost bare; palpi longer than usual, slightly spatulate at apices. Thoracic dorsum with sparse, erect, long hairs; three pairs of acrostichals in front of suture; prealar about one third as long as the bristle behind it; sternopleurals 1:2. Abdomen depressed, narrow, the segments subequal; seventh tergite (fifth visible) with numerous long fine bristles; fifth sternite with the processes short, glossy and almost bare at apices. Fore tibia with several fine setulose hairs on posterior surface, the apical posterior bristle minute; fore tarsi compressed, as long as tibia; mid femur with a series of strong bristles on basal half of anteroventral and posteroventral surfaces and another series above the latter; mid tibia with two posterodorsal and posterior bristles; hind femur with very long bristles, which are rather closely placed, on anteroventral and posteroventral surfaces, the latter not extending to apex; hind tibia with three long bristles on posterodorsal surface, about 8 or 9 short anterodorsal and anteroventral setulæ, and some hairs on middle of posterior surface. Costal thorn minute.

Female.—Differs from the male in having the head with brownish pruinescence, the interfrontalia reddish, and the abdomen unmarked.

The frons is one third of the head-width, the cruciate interfrontals are long, the palpi more noticeably spatulate, and the legs much less bristly.

Length, 3.5—4 mm.

Type, male, and allotype, Waterville, Me., May 11, 1906. (*Hitchings*).

The male of this species is distinguished from any in the genus known to me by the form of the processes of fifth sternite, armature of fore tibia, hind tibia, and mid and hind femora.

It bears a resemblance to *bicaudata* Malloch in some characters but is easily separated by the femoral bristling.

Calythea Schnabl and Dzeidzicki

This genus I distinguished from Anthomyia by the presence of fine hairs on the upper margin of the hypopleura in front of the spiracle, but I find that in most of the European specimens of the genotype there are no hairs present and when there are any they are very sparse and difficult to distinguish. My statement was based upon an examination of specimens which had either been named by Stein or compared with those so named. Just recently I have had some European specimens given to me and after an exhaustive examination of these desire to amend the generic definition as follows: Hypopleura usually with some fine hairs on upper margin in front of spiracle, absent only in *albicincta* Fallen, and with some similar hairs at lower posterior angle; prosternum always with some fine marginal hairs; hind tibia with one long posterodorsal bristle beyond middle; lower calyptra protruded; propleura bare below humeral angle, but with a dense tuft of setulose hairs above fore coxa; scutellum with fine hairs below.

Calythea separata sp. nov.

Male.—Similar to *albicincta* Fallen in general color and habitus. Differs in having no fuscous spot surrounding the posterior notopleural bristle, the anterior margin of thoracic dorsum less obviously grayish, the gray stripes on posterior

third of mesonotum much broader, that on line of intra-alar bristles more elongate, and the apex of scutellum more broadly gray.

Structurally this species differs from all others of the genus in having the antennæ separated at bases by a very noticeable rounded carina which is distinctly shining on upper part, and the epistome is much more produced, the anterior margin being almost in line with anterior margin of third antennal segment. Eyes subnude; arista almost bare. Hind femur usually with but two posteroventral bristles, one at base and the other near middle; posterodorsal bristle on hind tibia rather short.

Length, 3-4 mm.

Type, Buttonwoods, R. I., July 25, 1911. Paratype, Tiverton, R. I., July 31; Woodbury, N. J., June 27, 1896; Eastham, Mass., June 21, 1908 (C. W. Johnson); Potomac Run, Va., May 30, 1916, on *Chrysanthemum leucanthemum*; Chesapeake Beach, Md., September 19, 1915; Beltsville, Md., August 8, 1915 (W. L. McAtee); Denton, Texas, April 27 (C. R. Jones).

Stein has placed *micropteryx* Thomson, *anthracina* Bigot, and *monticola* Bigot as synonyms of *albicincta* Fallen and suggests the same relationship for *bidentata* Malloch. I have yet to see an authentic North American specimen of *albicincta*, my records and most if not all of those of Stein having reference to *micropteryx* Thomson, judging from what I know of the distribution of this species, which was described from California. It is highly probable that both the Bigot species are synonyms of this species also, but only an examination of the types will determine this. I have again examined the type of *bidentata* and consider that it is distinct from the other species, having a larger velvety brownish black frontal triangle, the orbits with denser bristles, the profile of the head different, and the dorsum of thorax and abdomen deep black, with only a very short whitish triangle on each side of the median line of each abdominal tergite. We have thus apparently three distinct species in North America, and from an examination of material which I was permitted to make in the U. S. National Museum by Dr. Aldrich I believe we have probably two others in South America and Mexico.

Spilogona Schñabl.

Spilogona will supplant Melanochelia Rondani as the generic name for the group dealt with under the last name in my paper in Canadian Entomologist, pages 61-64, 1921.

Spilogona argenticeps sp. nov.

Male.—Head black, entire frons, face, and cheeks densely white dusted, the two latter almost tomentose and silvery, back of head pale gray pruinescent. Thorax pale gray pruinescent, with three very faint dark vittæ; scutellum darker, more shining, and when seen from in front with the sides darker than the disc. Abdomen whitish gray pruinescent, first tergite largely black on disc, the next three each with a pair of large subtriangular black spots which extend almost the entire length of tergites and are distinctly separated in middle. Legs pitchy colored. Wings slightly grayish, veins brown, whitish at bases. Clyptræ white. Halteres yellowish white.

Frons a little less than one third of the head width, orbits not strikingly differentiated, narrowed posteriorally; ocellar bristles long; antennæ slender, third segment twice as long as second, its apex about one third from lower margin of face; arista pubescent; parafacial as wide as, cheek twice as high as width of third antennal segment; vibrissæ long; eyes much higher than long. Thorax with three pairs of postsutural dorsocentral bristles, the fine hairs very short and sparse; lower sternopleural bristle very weak. Abdomen narrowly ovate; hypopygium small, forceps much drawn out at apices (Fig. 1); fifth sternite not visible in type. Legs slender; fore tibia without a median posterior bristle; middle legs missing in type; hind femur with two or three fine setulæ near apex on antero-ventral surface, only one of these bristle-like; hind tibia with one anteroventral and two anterodorsal setulæ. Veins 3 and 4 slightly divergent at apices; outer cross-vein at a little less than its own length from apex of fifth vein; penultimate section of fourth vein less than half as long as ultimate section.

Length, 4 mm.

Type, Mt. Washington, N. H., August 8, 4000 feet.

This species is most nearly related to *caroli* Malloch to which it will run in my published key to the species already referred to. That species differs, however, in having the frons wider and, except for the orbits, black instead of white, the orbits with more numerous and stronger bristles, the legs stronger, and the fore tibia with a fine median posterior bristle.

The European species *pollinifrons* Stein, like *caroli*, has the cheek not higher than width of third antennal segment, and though the frons is white there is no anteroventral bristle on the hind femur, the last character being used as diagnostic in Stein's key to the European species.

Spilogona alticola Malloch.

This species is remarkably close to *contractifrons* Zetterstedt, to which it runs in all the keys to the European species which I have seen. To make certain of the specific status of the species I have dissected the male genitalia of both and present figures herein to illustrate their distinctions (Figs. 2 and 3). It is almost impossible to separate the species by the use of external characters. Staeger and Lundbeck have recorded *contractifrons* from Greenland but the records are probably erroneous.

Stein has recorded the closely related European species *baltica* Ringdahl as occurring in North America. The record should be confirmed by a comparison of the male genitalia of specimens from these continents before acceptance.

Spilogona novæ-angliæ Malloch

This species is very closely related to *brunneisquama* Zetterstedt (*armipes* Stein) which has been recorded from Washington State by Stein. I have dissected male specimens of both species and present figures of the hypopygia to show the specific distinctions (Figs. 4 and 5). Externally the species are almost the same and it is possible that Stein had *novæ-angliæ* and not *brunnesisquama* before him; an examination of his specimen is necessary to decide this, however.

Spilogona acuticornis Malloch.

This species is very closely related to *surda* Zetterstedt. It has, however, a distinct dorsocentral vitta between the spots on abdomen which is absent in *surda*, the frons is as wide as eye at middle as seen from in front, the apex of each process of fifth abdominal sternite is much more produced, and though, like *surda*, it has fine long bristly hairs on basal half of posteroventral surface of hind femur these are more numerous than in the latter and not in a single series. The crossveins of the wing are more widely separated than in *surda*.

One male, Machias, Me., July 17, 1909.

These notes are drawn from a comparison of the above specimen and an authentic male of *surda* sent to me along with *brunneisquama* and *contractifrons* by Mr. O. Ringdahl from Sweden.

Neohydrotæa, gen. nov.

Generic characters: Male.—Eyes bare, barrowly separated; arista distinctly pubescent on basal half; cheek narrow, with many marginal bristles, and 1 strong upwardly curved bristle about one third from anterior extremity. Prealar bristle strong, over half as long as the one behind it; sternopleura with lower posterior bristle distinct, but not nearly as long as the upper; hypopleura and pteropleura bare. Fore femora with a flattened, slightly excavated area at apex on ventral surface, basad of which on the antero-ventral surface the bristles are short and stout, no stout thorn present. In other respects as Hydrotæa.

Genotype, the following species.

Neohydrotæa hirtipes, sp. nov.

Male.—Black, shining. Head black, face and orbits with silvery pruinescence; antennæ black, third joint reddish at base on inner side; palpi brown. Thoracic dorsum with whitish pruinescence, most distinct, in the form of a broad vitta, on acrostichal area; viewed from behind the dorsum has a quadri-

vittate appearance. Abdomen with a slender black dorso-central stripe and very faint dark checkering, the surface with yellowish gray pruinescence. Legs yellow, fore coxæ brownish, mid and hind coxæ brownish, all trochanters, and the tarsi fuscous. Wings yellowish, noticeably so basally. Calyptra and halteres yellow.

Eyes at narrowest part of frons separated by a little more than width across posterior ocelli; antennæ not extending to lower margin of face, third joint twice as long as second; cheek about one eighth as high as eye. One pair of long widely separated acrostichals just in front of suture, the remainder of acrostichal area proximad of suture with 6 to 8 series of setulose hairs; 3 pairs of post-sutural dorsocentrals. Abdomen elongate ovate; fifth sternite with a groad rounded posterior excision, the lateral extremities slightly recurved ventrad as in Hydrotæa; hypopygium retracted, glossy black. Fore femur with a series of stout bristles on postero-ventral surface which is duplicated beyond middle, and on apical third the bristles become longer, more slender, and dense; antero-ventral surface with very short bristles up to beginning of the preapical excavation; fore tibia with black shaggy hairs on the entire length of postero-ventral surface, which are most dense near base; mid femur with several very long bristles on basal half of anterior surface; the ventral surface with a few widely placed bristles; mid tibia with three posterior bristles; hind femur with 5 or 6 long bristles on apical fourth of antero-ventral surface; hind tibia with apical half of ventral surface furnished with dense black hairs which are longer and bristly on antero-ventral surface; antero-dorsal surface with short hairs and 2 or 3 weak bristles; postero-dorsal surface with 2 or 3 bristles, the upper one straight; apex of tibia with 2 or 3 bristles, one of which on ventral surface is long and curved; tarsi long and slender. Outer cross-vein oblique, curved; veins 3 and 4 convergent apically.

Length, 8 mm.

Type locality, Chester, Mass., July 25, 1913 (C. W. Johnson).

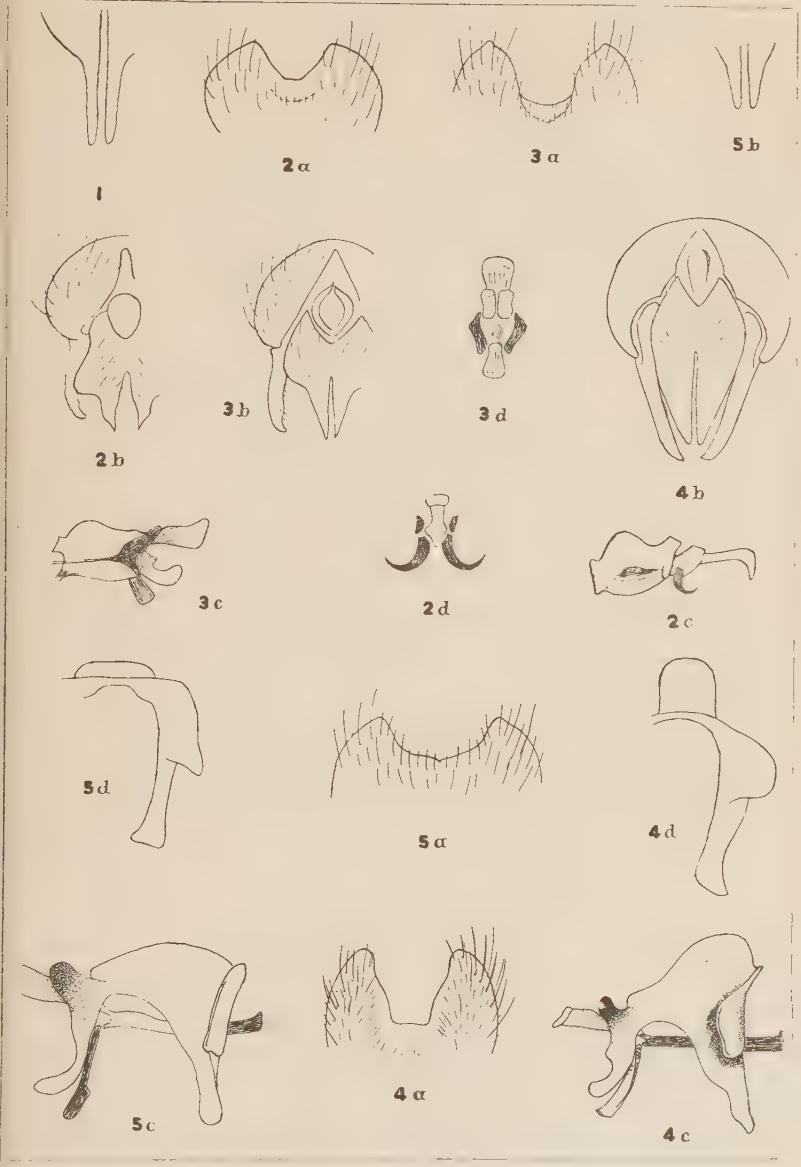
The only allied North American species which has yellow legs is *succedens* Stein, but this has the prealar bristle absent and the abdomen largely yellow. *H. succedens* appears to be a true Hydrotæa.

The type has a weak setulose hair near base of auxiliary vein on right wing and a similar setula on first vein near the same place on left wing. These setulæ are evidently abnormal and are not given in the description as either generic or specific characters.

Explanation of Plate IX.

Hypopygial Characters of Males of Spilogona.

Fig. 1, *argenticeps*, apex of superior hypopygial claspers.
" 2, *alticola*, a, fifth sternite; b, left half of hypopygium; c, lateral view of internal parts of hypopygium; d, cephalic view of base of apical parts of same.
" 3, *contractifrons*, same as above.
" 4, *novæ-angliæ*, a, fifth sternite; b, hypopygium from behind, c, lateral view of internal parts of hypopygium; d, front view of left half of last.
" 5, *brunneisquama*, letters same as in above but b shows apex only of superior hypopygial claspers.



MALLOCH—HYPOPYGIAL CHARACTERS OF SPILOGONA.

ADDITIONS TO THE PHORIDÆ OF FORMOSA (DIPTERA)[1]

By Charles T. Brues.

In 1911[2] the present writer published a list of the Phoridæ of Formosa, based on collections made by Mr. Hans Sauter during the years 1907 and 1908. Several years later, in 1911 and 1912 the same collector obtained an additional extensive series which are dealt with in the present paper. The material here considered, like the previous series was loaned from the collections of the Hungarian National Museum by my good friend the late Dr. K. Kertész and the types have been returned to the museum. The first collection contained twenty species, all but one undescribed at that time. The present one includes fifteen species of which eight are new and seven have been previously described; of the latter one is the widespread *Aphiochæta picta* Lehm., another a species known from Java and seven were described from Formosa in my previous paper.

Thirty species are therefore at present known to occur in Formosa, distributed in the following genera: Dohrniphora (4), Hypocera (1), Conicera (1), Aphiochæta (21), Phalacrotophora (1), Mallochina (1), and Puliciphora (1). Becker has reported the occurence of *Aphiochata flava* Fall., *A. lutea* Meig. and *A. pulicaria* Fall., and described *Aphiochæta fasciventris* which is not recognizable from his description. His *Phora bicolorata* is a synonym of the first species listed below.

Dorniphora egregia Brues.

Ann. Mus. Hungarici, vol. 9, p. 534 (1911). (Phora).

Becker, Suppl. Entom., No. 3, p. 88 (1914) (*Phora bicolorata*).

Brues, Journ. New York Entom. Soc., vol. 23, p. 184 (1915).

This is evidently a common species as there are nine specimens from Kaukau (April, July and August) and Taihorin (May, July, August). It occurs also in Java. The proboscis of

[1]Contributions from the Entomological Laboratory of the Bussey Institution Harvard University, No. 239.

[2]The Phoridae of Formosa. Ann. Mus. Nat. Hungarici, vol. 9, pp. 530-535, 19 figs. (1911).

the female is strongly chitinized, twice as long as the head-height, stout and geniculate at the middle.

The chætotoxy of the hind tibiæ is variable; in one male the hind tibia bears a bristle at the basal third and one beyond the middle, and in two of the females there is still another at the basal sixth; a single bristle just beyond the basal third is the most common arrangement. The front and mesonotum are sometimes reddish and the hind legs may be entirely yellowish.

Dohrniphora conventa Brues.

Ann. Mus. Nat. Hungarici, vol. 9, p. 535 (1911) (*Phora*)

A long series of over sixty specimens representing both sexes are in the present collection. They are from Taihoku and Anping, taken during April and May.

Dohrniphora mordax Brues.

Ann. Mus. Nat. Hungarici, vol. 9, p. 531 (1911).

A series of nearly sixty specimens of this species was obtained at Anping during May "from a box with papers, etc. which had been eaten by termites and containing also a rat's nest." From this it is probable that this form like several of its congeners develops in decaying animal matter.

Phalacrotophora Enderlein

Phalacrotophora punctifrons sp. nov.

♀. Length 2-2.7 mm. Fulvous yellow, mesonotum darker and pleuræ lighter below; palpi and legs testaceous; front piceous, yellowish near the lower margin; abdomen yellowish black at apex with a black spot at each side of the second segment and a brown one at the side of the third; first, second and third segments with a brown streak across the hind margin, except at the sides. Wings strongly tinged with yellow, the

heavy veins light brown, light veins darker brown. Front slightly more than twice as high as broad. Four proclinate bristles of nearly equal size; upper pair occupying one-third the width of the front, lower pair one-sixth; inner bristle of next row near the eye-margin and well above the post-antennals, inner bristle very close to the eye and but little below the middle of the front; upper row with the lateral bristle very close to the eye, the inner bristle considerably higher, all bristles equidistant; ocellar row of four strong bristles. Ocellar tubercle and median frontal groove distinct; vertex slightly elevated, sharp above. Front covered with sparse, rather strong setigerous punctures. Antennæ small, nearly round, well retracted within their cavities; arista bare, as long as the eye; palpi small, with rather short bristles. Postocular cilia strong, larger near the middle of the eye; cheek with two stout bristles and a series of smaller ones between these and the antennæ. Mesonotum subshining, clothed with minute silky black hairs; two widely separated dorsocentral bristles with several long black hairs between them. Scutellum large, semicircular, with two very strong marginal bristles and a weak hair at each corner. Propleura with three bristles near the coxa, three weaker ones above and a few hairs between. Mesopleura above hairy like the mesonotum, with one stout bristle almost as long as the eye at the lower hind angle of the hairy area. Sides of second segment with a brush of stiff, bristly hairs; third segment with a few scattered black hairs behind, especially at the sides. Fourth segment soft and membranous, very pale; following darker, but still weakly chitinized; last segment narrow, tubular, black, with longitudinally striated chitinous covering. Legs rather stout, the hind pair especially so. Front tibiæ with a single line of close-set setulæ, their tarsi slender; middle tibia with a series of strong setulæ on each side of the seam, the outer row absent, however, on the apical third; hind tibiæ also with two rows, the inner one slightly stronger, with about ten bristles, and the outer one with only eight as it does not extend quite to the tip of the tibia. Hind metatarsus not noticeably thickened. Costa extending barely beyond the middle of the wing, not thickened, its cilia short and densely placed; first section one-fourth longer

than the other two together; third one-third as long as the second; second vein leaving the third at a very acute angle; third vein nearly straight, lying near to the costa; fourth vein arising at the fork, bent at the base, straight beyond; fifth bent just before the middle, but scarcely sinuate; seventh long, nearly straight.

Type and four paratypes from Tainan, Formosa, April.

This is a typical member of the genus with the long narrow front and biseriately setulose middle and hind tibiæ. Two species of Aphiochæta known from Formosa, *A. atriclava* Brues and *A. flaviclava* may be distinguished at once by the shorter front. From *Phalaczotophora jacobsoni* Brues described from Java the present species differs most conspicuously by having the front punctate, not smooth and polished.

Aphiochæta Brues.

As in other parts of the world where Phoridæ have been collected, this genus is represented by more species than all the other genera of the family combined, and on account of the large number of Formosan species, a key has been included to facilitate their identification.

Key to the Formosan Species of Aphiochæta.

1. Hind tibia with only a single row of setæ, placed just inside the posterior edge. . . . . 2.
   Hind tibiæ with a series of setæ, sometimes only on the basal half, just outside the edge, in addition to the inner series. . . . . 19.
2. Mesopleura bare. . . . . 3.
   Mesopleura above with a patch of bristly hairs which sometimes includes also a large bristle. . . . . 16.
3. Scutellum with two bristles. . . . . 4.
   Scutellum with four equal, or nearly equal bristles. . . . . 14.
4. Costa about half as long as the wing or longer. . . . . 5.
   Costa very short, about one-third as long as the wing *pygmæa* Zett.

5. Front much shortened, twice as broad as high; four proclinate bristles of equal size. . . . . *curtifrons* Brues.
Front quadrate, or with the lower proclinate bristles weaker than the upper pair. . . . . 6.
6. Halteres black, much darker than the mesonotum. . . . . 7.
Halteres pale, much lighter than the mesonotum. . . . . 10.
7. Costal vein extending far beyond the middle of the wing: fourth vein curved forward at both base and apex; wings distinctly infuscated. . . . . *chipensis* Brues
Costal vein not noticeably more than half the wing-length 8.
8. Four well developed proclinate bristles, setulæ of hind tibiæ well developed. . . . . 9.
Only two proclinate bristles, the lower pair reduced to fine hairs, hind tibiæ obsoletely setulose. . . . . *meracula* Brues.
9. Costal bristles extremely minute; setulæ of hind tibiæ rather small. . . . . *meijerei* Brues.
Costal bristles larger, but rather short; setulæ of hind tibiæ long. . . . . *sauteri* Brues.
10. First section of costa longer than the second. . . . . 11.
Second section of costa longer than the first. . . . . 13.
11. Wings hyaline; front about as wide as high; second vein nearly perpendicular to the costa. . . . . *nana* Brues.
Wings distinctly infuscated; front wider than high. . . . . 12.
12. Costal cilia very short and densely placed; abdominal tergites normal. . . . . *formosana* sp. nov.
Costal cilia long and rather closely placed; third tergite reduced in female. . . . . *pedicellata* sp. nov.
13. Middle row of frontal bristles forming a straight transverse row; thorax piceous; hind legs very slender. *recta* Brues.
Middle row of frontal bristles strongly curved downwards medially; thorax yellowish brown; legs moderately stout. *curva* Brues.
14. Costal vein less than two fifths as long as the wing. *insulana* Brues.
Costal vein extending to the middle of the wing. . . . . 15.

15. Four proclinate bristles on the front; second vein entering the costa almost at a right angle; costa extending distinctly beyond middle of wing. . . . . *trivialis* Brues.
Only two proclinate bristles; fork of third vein very acute; costa extending just to the middle of the wing.
brunnicans sp. nov.

16. Scutellum with four bristles; halteres yellow. *ochracea* Brues.
Scutellum with only two bristles; halteres black. . . . . 17.

17. Costa about half as long as the wing. . . . . 18.
Costa only two-fifths as long as the wing. *breviuscula* sp. nov.

18. One of the mesopleural bristles greatly enlarged; wing broad especially at base. . . . . *æmula* Brues.
Mesopleura with the bristly hairs all small; wing long and quite narrow. . . . . *simplicior* Brues.

19. Four scutellar bristles; mesopleura bare. . . . . *picta* Lehm.
Two scutellar bristles; mesopleura above with bristly hairs and one large bristle. . . . . 20.

20. Halteres pale. . . . . 21.
Halteres black; mesonotum yellowish brown. *articlava* Brues

21. Front one-third higher than broad; wings hyaline; costa half as long as the wing. . . . . *flaviclava* Brues
Front quadrate; wings distinctly yellowish; costa extending well beyond the middle of the wing. *lanceolata* sp. nov.

Aphiochæta meijerei Brues.

Journ. New York Entom. Soc., vol. 23, p. 189 (1915).

This species was described from Java. There are six specimens representing both sexes from Formosa, collected at Anping during April, 1912, and at Tainan during April, May and June, 1912. The female does not differ essentially from the male from which the species was described.

The setæ of the hind tibiæ form a single row just inside the posterior edge, but those of the middle tibiæ are disposed in two rows, one on each side of the hair-seam.

Aphiochæta formosana sp. nov.

♂. Length 1.7-2.1 mm. Head and thorax brown, the front blackened, except at the edges and upper corners; abdomen black, dull yellow on the base of the first segment; segments one to six with dull yellow posterior margins, wider on four and five which have the middle portion brown; antennæ rufous, with the tip of the third joint black; palpi yellow; pleuræ dark brown above, lighter below; legs yellowish brown, the hind femora blackened at tips. Wings with a decided brownish tinge especially around the margins; venation deep brown; halteres pale brown, concolorous with the lower part of the pleuræ. Front distinctly wider than high; four postantennal bristles, the lower pair much weaker and closer together than the upper pair which occupy one-fifth the width of the front; inner bristle of lowest reclinate row on a level with the upper proclinate bristle and midway between it and the eye, the outer bristle well above it and less than half as far from the eye. Upper postocular cilium much enlarged, the others all strong and well-developed; cheek with a pair of strong bristles and a line of small ones extending to the antenna. Palpi with very strong bristles at tips. Antennæ rather small; arista stout, pubescent, as long as the head-height. Mesonotum distinctly shining, with one pair of dorsocentral bristles; scutellum nearly as long as wide, with only two bristles, placed near the margin. Propleura with several minute bristles above and several larger ones below. Mesopleura bare. Second segment of abdomen with a conspicuous tuft of bristles at the sides, much longer than the third; third to sixth gradually growing shorter. A marginal row of short bristly hairs on segments two to five; sixth with similar ones on the disc. Hypopygium small, shining, with fine bristly hairs below. Apical lamella large, orange yellow, sparsely hairy, with the two apical bristles small. Front tarsi slightly thickened, the second and following joints each but little more than twice as long as thick, the first three together as long as the tibia. Middle tibia with a row of very weak cilia inside the posterior edge; hind pair with a stronger series of about 10-12 cilia, longest near the middle of the tibia where they are slightly longer than

half the width of the tibia. Wings rather narrow, especially toward the tip, the costa and third vein not at all thickened apically, unusually far apart toward the base; costa just half the length of the wing with very short and densely placed cilia; first section as long as the second and third together; third one-third as long as the second; second vein very oblique, the cell narrow; fourth vein faintly curved near base, straight beyond; fifth and sixth each bisinuate, nearly parallel on the basal half and strongly divergent apically; seventh almost straight. In one wing the fourth vein is furcate near the tip where it gives off an oblique forwardly directed branch, an abnormality which I have never seen in any other Phorid.

Type, four paratype males and one female all from Taihoku, Formosa, May 1912 (Sauter).

In Lundbeck's table of European species (Diptera Danica, Pt. 6, p. 212) this runs to *A. uliginosa* Wood, from which it differ by the brownish wings and extremely short costal cilia. The thorax is also much lighter colored than in the European species. It is not very similar to any described oriental species.

The female is essentially like the male, with the front tarsi equally thickened; the costa is slightly, but quite distinctly longer than half the length of the wing.

Aphiochæta pedicellata sp. nov.

♀. Length 2.0 mm. Thorax dull ferruginous, the mesonotum fuscous; legs dark brownish yellow; front black, whitish pollinose; abdomen piceous or black, the fourth segment with a yellowish stripe on each side of the median line; antennæ rufo-piceous; palpi dark yellow. Wings distinctly tinged with brown, venation clear yellowish brown. Halteres light yellow. Front broad, fully one-half wider than high; its bristles strong, more nearly perpendicular to the surface of the front than usual; four postantennal bristles, the lower pair considerably smaller and not much more approximate than the upper which are separated by one-fourth the width of the front; inner bristle of lowest reclinate row midway between the upper proclinate bristle and on a level with it; lateral one but little higher, close to the eye;

upper row forming a nearly straight line, its bristles equidistant with the lateral one close to the eye; ocellar tubercle and median frontal groove distinct. Antennæ small, round; arista strongly pubescent, one-fourth longer than the head height. Palpi rather large, with strong marginal bristles near tips. Cheeks each with three strong downwardly directed macrochætæ and a series of smaller bristles extending to the base of the antenna. Mesonotum rather long, highly convex; one pair of dorsocentral bristles set as far apart as the lateral corners of the scutellum. Scutellum nearly twice as broad as long, with two marginal bristles, but no trace of a second pair. Propleura with a tuft of small bristles above, several more below near the coxa and a series of minute ones between, along its posterior margin. Mesopleura entirely bare. Abdomen with some short hairs at the sides of the second and third segments, but without distinct lateral tufts; first three tergites completely chitinized; fourth with a short basal chitinized band and a very narrow median stalk-like chitinized strip, but with the sides entirely membranous; segments five and six chitinized as usual (these may be the sixth and seventh if two segments are included in the structure described above as the fourth, which I think may possibly be the case); next segment short and very narrow, pale; last narrow, tubular, black. Legs rather slender; fore tarsi slightly, but distinctly thickened, the second and following joints but little more than twice as long as broad. Cilia of hind tibia in a single row, rather delicate, the larger ones near the middle of the tibia about two thirds as long as its width; internally at the tip the hind tibia bears three comb-like transverse rows of minute bristles. Costa extending to distinctly beyond the middle of the wing, its bristles long and rather closely placed; first section barely longer than the second; third nearly half as long as the second (22:19:9); fork of third vein not very acute, the cell rather large; fourth vein strongly curved near base, more weakly so beyond, recurved at the extreme base; fifth nearly straight; sixth weakly bisinuate, seventh faintly curved.

Type from Taihorin, Formosa, July, 1911 (Sauter).

This is a very distinct species, resembling the Formosan *A. curtifrons* Brues, from which it differs by the long costal cilia.

Th ereduction of the abdominal tergites is somewhat similar to that of several European species, a character formerly overlooked, but recently described by Lundbeck and Schmitz.

Aphiochæta insulana Brues.

Ann. Mus. Nat. Hungarici, vol. 9, p. 542 (1911).

There are upwards of 150 females from Anping, Formosa, April to June, 1912. The species varies greatly in size, ranging from 1.4 to fully 2 mm. in length.

This species resembles *A. curtineura* Brues from the Philippines, but there are four strong scutellar bristles, instead of two and the mesopleura is bare; the propleura bears a large, conspicuous bristle at its posterior angle just below the spiracle.

Six males in the collection, also from Anping, possibly represent the other sex of this species. They are much darker with the thorax fuscous and the legs dull brown. The abdomen is black, with narrow apical whitish bands at the apices of all the tergites. The scutellum bears only two bristles. If these should prove to be the male, the species must be like a few other members of the genus dimorphic, the males having two and the females four scutellar bristles.

Aphiochæta brunnicans sp. nov.

♀. Length 2 mm. Thorax above brownish yellow; front piceous, somewhat lighter below; abdomen black, with very narrow pale posterior borders on segments 1 to 4; antennæ piceous; palpi pale yellow; pleuræ fuscous, much paler below; legs light brownish yellow, tips of hind femora blackened; halteres pale brownish; wings distinctly tinged with brownish yellow, the venation fuscous, the discal veins heavy. Front quadrate or barely wider than high; ocellar tubercle and median groove present. Only two proclinate postantennal bristles, but these are large and strong, set half as far from one another as from the eye-margin; inner bristle of lowest reclinate row on a level with the proclinate bristle and midway between it and the eye-margin,

the outer bristle close to the eye and only slightly higher than the inner one; middle row of four equidistant bristles, the lateral ones very close to the eye and set distinctly higher than the middle ones; ocellar row of four bristles, uppermost postocular cilium very much enlarged, directed upward and inward, lower cilia somewhat enlarged; cheek with a pair of macrochætæ; a series of four strong bristles between them and the base of the antennæ; antennæ of moderate size, with a stout pubescent arista as long as the head-height. Palpi rather large, closely and strongly bristled. Mesonotum quite shining; with a bristle above the spiracle and two dorsocentral macrochætæ; scutellum nearly twice as wide as long, with four large bristles behind, the lateral pair distinctly smaller, but still well developed. Propleura bristly above, along the posterior margin, and with three rather strong bristles just above the coxa. Mesopleura bare. Abdomen with segments two to six of nearly equal length, the second, at the sides with a very noticeable tuft of bristles; sixth at the tip with a fringe of bristly hairs; all tergites fully chitinized Legs moderately stout, but not thickened; anterior tarsi slender middle tibiæ with a series of extremely minute cilia just inside the posterior edge; hind tibia with a similar series of rather small cilia which are stronger near the middle and weaker at base and apex. Costa extending just to the middle of the wing, with rather short, very closely placed cilia; first section slightly longer than the other two together; second three times as long as the third, the second vein leaving the third at a very acute angle, so that the lower side of the cell is twice as long as the upper; fourth vein curved at the base, but almost straight beyond, originating distinctly beyond the fork of the third vein; fourth and fifth very slightly sinuous; seventh faintly curved; wing large and rather narrow. Halteres brownish yellow.

Type from Tiahoku, Formosa, April 1912 (Sauter).

This species resembles *A. humeralis* Zett, but differs in the weak cilia of the hind tibia, very much higher front and non-thickened costa. From *A. rubricornis* Schmitz it differs by the absence of the lower postantennal bristles, weaker cilia of the hind tibiæ and in the course of the fourth vein. From *A. errata* Wood it differs by the longer first costal division and absence of

a distinct intraalar bristle. Among the previously known Formosan species it resembles *trivialis* Brues most closely, but differs conspicuously in color and wing venation.

Aphiochæta ochracea Brues.

Ann. Mus. Nat. Hungarici, vol. 9, p. 543 (1911).

There is an additional female from Taihoku, April 1912 (Sauter). This specimen differs from the type, which was from Takao, in having the abdomen generally blackened above, but I can find no structural differences.

Aphiochæta breviuscula sp. nov.

♂. Length 1.3 mm. Dark brown or piceous, the head and abdomen darker, almost black, and the pleuræ lighter below; legs yellowish brown, the hind pair much infuscated and the front pair much lighter; antennæ piceous; palpi pale yellow; apical lamella of hypopygium yellowish brown; halteres very dark brown or black. Wings hyaline, veins piceous, the thin veins very distinct. Front very slightly higher than broad, with the ocellar tubercle and median frontal line distinct. Four proclinate post-antennal bristles of very nearly equal size; upper pair more than twice as far apart as the median ones, midway between the median line and the eye margin and on a level with the inner bristle of the row above; outer bristle of lowest reclinate row next to the eye, the inner one well below it and twice as far from it as from the eye-margin; upper frontal row of four equidistant bristles with the lateral ones very close to the eye, curved downwards medially; median pair of the ocellar row very large, two-thirds as long as the height of the front. Cheek with three stout bristles. Antennæ small; arista densely pubescent, one-fourth longer than the front. Palpi of moderate size, with rather strong bristles. Mesonotum quite shining, closely and finely hairy over its entire surface. One pair of dorsocentral bristles, without any smaller bristles between them. Scutellum twice as broad as long, with one pair of very

large bristles, much stronger than the dorsocentrals, but with no trace of the second pair. Second abdominal segment slightly lengthened; third to sixth of equal length; dorsum and sides without hairs or bristles, except for some small hairs on the sixth segment. Hypopygium smooth, without bristles; apical lamella of moderate size, with two upturned bristly hairs at tip; when well extruded the hypopygium shows two large ventral hook-shaped pieces and one or two long slender curved bristles below and above near the base. Propleura with several stout bristles just above the coxa and one very small one above near the spiracle; mesopleura with a patch of bristly hairs above and one very large backwardly directed bristle at the lower posterior corner of the bristly area. Wing rather broad, evenly oval. Costa two-fifths as long as the wing, closely ciliate, the cilia short at base, but apically somewhat longer than the second costal division; first division one and one-half times as long as the other two together; second barely longer than the third; second vein rising abruptly to the costa; third vein very widely separated from the costa at the base; fourth vein weakly and evenly curved, recurved at extreme tip; fifth weakly bisinuate, ending as far from the wing tip as the fourth; sixth strongly bisinuate; seventh curved, long. Front legs with the tarsi thickened, the metatarsus nearly as thick as the tibia; middle tibia with six or seven very small setæ on basal three fourths; hind tibia with a series of about eleven, very minute basally but longer beyond the middle of the tibia; hair-seam along the posterior edge curved outwards toward the tip.

Female essentially like the male, but larger, 1.5 mm. in length; dorsal abdominal plates, including that of the third segment of full width.

Male type and five paratypes and two females from Anping, Formosa (Sauter) collected during April and May 1912.

On account of the bisetose scutellum, very short costa and bristly mesopleura with one large bristle this species is close to three European species described by Wood. From *A. hirsuta* it differs by the pale palpi; from *A. spinata* by the long costal cilia and shorter first section of costa; and from *A. pectoralis* by the pale palpi. These species are widely separated in Wood's

tables, but Lundbeck has grouped them together with a few other European species on the basis of the two scutellar bristles, very short costa and the enlarged bristle with a patch of small ones on the mesopleura above.

Aphiochæta simplicior sp. nov.

♂. Length 1.9 mm. Black, the lateral margins of the mesonotum fuscous; pleuræ fuscous above, yellowish brown below; front legs light brownish yellow; middle and hind ones much darker, fuscous, with the posterior surface of the tibiæ almost black; palpi and terminal lamella of hypopygium honey yellow or brownish. Wings strongly tinged with brown, venation piceous. Halteres black. Front about one-fourth wider than long; four post antennal bristles, all large, but the upper considerably stronger and placed unusually far above the lower ones; upper pair separated by a little more than one-third of the width of the front, the lower pair half as far apart; bristles of lowest reclinate row rather close together at the side of the front, their bases indicating a line 45° from the vertical; lateral one on a level with the upper postantennal and very close to the eye; next row above of four equidistant bristles forming a line that curves slightly downward at the middle; ocellar row large and strong like the others; ocellar tubercle and median frontal groove well developed, the surface of the front slightly pollinose. Antennæ rather large, oval; arista slightly longer than the head height, very thinly pubescent. Palpi with long stout bristles apically. Cheeks each with three strong downwardly directed bristles and a row of short ones between these and the antenna. Mesonotum rather shining, almost bare in front; highly convex; one pair of dorsocentral bristles, with irregular bristly hairs between them. Scutellum rather long, scarcely twice as broad as long, with two large marginal bristles and two microscopic hairs. Propleura with four bristly hairs above and four longer ones below, but with none between these. Mesopleura above with a patch of bristly hairs, but without any greatly enlarged bristles although those near the posterior margin are distinctly larger. Abdomen with the second and sixth segments slightly length-

ened; second with a very inconspicuous tuft of minute bristles laterally, otherwise the first four segments are practically bare; fifth and sixth with scattered fine bristly hairs. Hypopygium small, almost bare. Wings long and quite narrow; costa extending to barely beyond the middle, the costa and second vein close together; costal cilia closely placed and rather short, about three times as long as the thickness of the costa; first section as long as the second and third together, the third fully half as long as the second; fork of third vein acute; fourth vein gently and evenly curved, with recurved tip; fifth almost straight; sixth very weakly sinuate; seventh gently curved. Legs rather slender; front tarsi not thickened. Middle tibia with delicate but distinct setulæ; those of the hind tibiæ rather strong, in a single line just inside the seam; hind metatarsi conspicuously spinose beneath.

Type from Taihoku, Formosa, April 1912 (Sauter).

This species resembles the Formosan *A. canaliculata* Brues in the mesopleuræ and wings, but differs by the different proportions of the costal divisions and much shorter costal cilia. Among the European species it will run to *A. armata* Wood in Lundbeck's table (Diptera Danica, pt. 6, p. 219) from which it differs by the brown wings, darker palpi, shorter first costal division, and concealed ventral process of hypopygium.

Aphiochæta picta Lehmann.

A single female of this species from Kankau, July 1912, considerably extends the range of this species which is already known from Europe, North America and southern Africa.

Aphiochæta lanceolata sp. nov.[1]

♀. Length 1.5 mm. Head, thorax and legs in great part brown; abdomen black. Front yellowish below, infuscated above, the ocellar triangle black; antennæ deep yellow, darker at apex; palpi pale yellow; mesonotum fuscous, lighter behind and yellowish on the sides behind the wings. Pleuræ and four posterior coxæ light fuscous; front legs yellowish, middle ones

more brown and hind ones darkened beyond the base of the femur; wings distinctly yellowish, venation light brown. Front quadrate; median line and ocellar tubercle distinct; four large postantennal bristles, the lower ones slender, close together; upper ones widely separated, as far from the median line as from the eye-margin, well above the lower ones and on a level with the inner bristle of the lower reclinate row which is close to the eye margin and directly below the lateral bristle; next row of four equidistant and distinctly bowed downward medially. Antennæ small, arista nearly bare, scarcely one half longer than than the head-height. Palpi with strong bristles below. Cheeks each with two downwardly directed bristles and a row of several smaller ones extending toward the antenna. Mesonotum subshining, with one pair of dorsocentral bristles and a strong bristle at the lateral margin just anterior to them; scutellum one-half broader than long, with only two bristles. Propleura with a few scattered minute hairs and three bristles at the base of the anterior coxa; mesopleura finely bristly above, with one large backwardly directed bristle inserted at the upper posterior angle. Abdomen with the third segment elongated, one-half longer than the second which has a small tuft of long bristles at the sides; fourth segment not abbreviated; ovipositor pale yellowish. Anterior tibiæ without setulæ, their tarsi slender; middle tibiæ weakly setulose inside the seam and with a row of setulæ outside the seam on the basal half; posterior ones similiar, but the setulæ are moderately strong in both rows, numbering seven or eight and being over half as long as the width of the tibia. Wings very narrow; costal vein extending well beyond the middle, with very short and fine, closely placed bristles; first section as long as the second and third together, the third nearly half as long as the second. Third vein running nearly parallel to the costa, but approaching it more rapidly beyond the fork which forms a very acute angle; fourth vein curved only at the base, ending no nearer to the wing-tip than the fifth; fifth, sixth and seventh nearly straight. Halteres yellowish white.

Type from Taihorin, Formosa, July 1911 (Sauter).

This species is related to *A. ciliata* Zett and the several

similar palæarctic species, and especially to *A. flavescens* Wood, from which it differs at once in having the fourth abdominal segment of normal size in the female. From all the members of this group it may be separated by the presence of the second series of setæ on the hind tibia.

Mallochina sauteri sp. nov.

♂. Length 1.0 mm. Black, slightly brownish on the pleuræ and the sides of the mesonotum in front; legs brownish yellow, the hind pair considerably darker; palpi pale yellow; antennæ brownish basally, but black at tips; dorsal lamella of hypopygium fuscous. Wings hyaline, heavy veins dark brown, light veins very delicate; halteres piceous. Front quadrate or slightly higher than broad, with three transverse rows of four bristles each and four post-antennal bristles. Upper post-antennals occupying one-third the width of the front; lower ones smaller and closer together; bristles of lower reclinate row forming a pair at each lower angle of the front, the inner one on a level with the upper post-antennal and almost directly below the outer bristle, although not quite so close to the eye; upper row slightly curved downwards medially, its bristles equidistant; ocellar row as usual; ocellar tubercle and median frontal groove present. Antennæ of moderate size; arista nearly bare, as long as the head-height. Palpi small, with the usual bristles of moderate size; cheeks each with a pair of very large bristles. Mesonotum distinctly shining, with one pair of small, widely separated dorsocentral bristles close to the posterior margin. Scutellum twice as broad as long with a single pair of very long bristles. Propleura with two minute bristles just above the coxa; mesopleura hairy above, with one or two small bristles at the lower posterior corner of the patch of hairs. Abdomen with the fifth segment slightly elongated; upper surface bare, no hairs at the sides of the second segment. Hypopygium minutely bristly at the sides and below. Legs slender, the front tarsi somewhat stouter than usual, but not greatly thickened, the metatarsus much narrower than the tibia. Middle and hind tibiæ with distinct hair-seam along the upper edge, and with a single row

of extremely delicate setulæ. Single spur of middle tibia more than half as long as the metatarsus; spur of hind tibia much shorter. Costa barely, but distinctly less than half the length of the wing; cilia rather short and sparse, with about 15 in each of the two rows. First section of costa almost twice as long as the second; first vein unusually slender; second not forked at tip, slightly thickened on its apical half, fourth vein gently and evenly curved, fifth and sixth weakly bisinuate; seventh nearly straight.

Type and paratype from Anping, Formosa, April 1912. Named in honor of Mr. H. Sauter whose vast collection of insects from Formosa have enormously increased our knowledge of its fauna. A third specimen (Anping, May 1912) without head probably belongs here also.

This species is closely related to *M. exempta* Becker, the type and only species of Mallochina. It differs in the quadrate front, more slender front tarsi, longer costa and comparatively longer first costal division.

ON THE ANT-GENUS CHRYSAPACE CRAWLEY.

By William Morton Wheeler.

Bussey Institution, Harvard University.

Very recently Mr. W. C. Crawley has described a beautifully sculptured Ponerine ant from Sumatra as *Chrysapace jacobsoni* gen. et sp. nov. (Ann. Mag. Nat. Hist. (9) 13, 1924, p. 380). Among a lot of Formicidæ generously sent me by Dr. K. W. Dammerman of the Buitenzorg Museum I find a specimen of this same insect, which was taken by Karny at Wai Lima, Lampong, Southern Sumatra, Nov. 12, 1921. It agrees in all respects with Crawley's description and figure and awaited description in my collection under the label "*Cerapachys mirandus* sp. nov." Crawley's description of the sculpture is somewhat incomplete. In my specimen, which like his possesses three small, closely approximated ocelli and is therefore apparently an ergatomorphic female, the ventral surface of the post-petiole is very regularly, transversely costate and the sternites of the second, third and fourth gastric segments, which are exposed, have their basal surfaces developed as very finely striated stridulatory organs and their apical borders pitted, or cribrate.

Crawley calls attention to the affinities of this insect with *Cerapachys* F. Smith and *Phyracaces* Emery but decides to make it the type of a distinct genus. In my opinion the matter is not quite so simple. In the Ponerinæ of the "Genera Insectorum" (1911) Emery recognized *Cerapachys* and *Phyracaces* as independent genera, the differences being that in the former the worker and female have the terminal antennal joint enlarged to form a distinct club and the petiole and postpetiole non-marginate on the sides, whereas, in the latter the terminal antennal joint is not enlarged to form a club but tapers to a blunt point and the sides of the petiole and sometimes also of the postpetiole are marginate. Crawley's genus is clearly intermediate in that the body is that of a *Cerapachys* s. str. while the antennæ are those of a *Phyracaces*. The peculiar sculpture cannot be regarded as a generic character and the narrowness of the petiole and

postpetiole recurs in the East Indian *Cerapachys antennatus* F. Smith, which happens to be the type of the genus.

Emery seems to have regarded the non-clavate antennæ and margination of the petiole as more important characters than the number of antennal joints since he made *Phyracaces* an independent genus and separated *Cerapachys* into four subgenera on this character, namely *Cerapachys* sens. str. with 12, *Parasyscia* with 11, *Oöceræa* with 10 and *Syscia* with 9 joints. But the finding of an intermediate form like *Chrysapace* brings us face to face with a dilemma. Either we must raise all the subgenera mentioned to generic rank and retain *Chrysapace* and *Phyracaces* as independent genera or we must reduce these two genera to subgeneric rank under *Cerapachys*. The "splitters" will probably adopt the former, the "lumpers" the latter alternative. Should the lumpers carry the day the specific name of Crawley's species will have to be changed, because Forel had previously described a *Cerapachys jacobsoni* from Java (Notes Leyden Mus. 34, 1912, p. 103). In that case I suggest that the Sumatran ant be called *Cerapachys* (*Chrysapace*) *crawleyi* nom. nov. It is, however, not improbable that we shall do more splitting in the Cerapachyinæ in the near future. The subfamily is proving to be more extensive than we had supposed. Mr. James Clark and I have recently brought to light quite a number of species of *Eusphinctus* and *Phyracaces* in Australia and there are several diverse, undescribed species of *Cerapachys* and *Phyracaces* from the East Indies in my collection. The sexual phases, larvæ and pupæ of the great majority of Cerapachyinæ are quite unknown. A knowledge of these phases and stages will probably aid materially in a final revision of the genera and subgenera of the subfamily.

BRIEF DIAGNOSES OF SOME DIPTERA OCCURRING IN NEW ENGLAND.

By C. H. Curran.

Department of Agriculture, Ottawa, Canada.

The following very brief descriptions, enumerating the salient points in the detailed descriptions of several species, of Diptera are given herewith in order that the names may be included in Mr. Johnson's forthcoming list of the Diptera of the New England States. The detailed descriptions will be found in a contribution to a monograph of the Syrphidæ and a revision of the genus *Rhaphium* prepared by the writer.

Microdon pseudoglobosus new species.

Brownish and reddish, with darkened wings; third antennal joint of almost equal width throughout and a little shorter than the first two combined; ocellar triangle small, equillateral; apex of scutellum with a wide even concavity the broad points moderately projecting. Hind basitarsi of ♂ greatly swollen. Length, 7 to 8 mm.

♂, Lucaston, N. J., Sept. 14, 1917, (Daecke); ♂ same locality, June 27, 1902; ♀, Hammonton, N. J., Sept. 6, 1902; ♀, Da Costa, N. J., July 1, 1905; ♂, Cape May, N. J., July 8, (Viereck); ♂, Aweme, Manitoba, Aug. 11, 1920, (Robertson); Chittenden, Vt., Aug. 15 (Bequaert), and specimens mentioned in detailed description.

Microdon conflictus new species.

Chiefly brownish, the abdomen sometimes partly reddish; wings largely dark brown; third antennal joint but little longer than the first; ocellar triangle small, wider than long; apex of scutellum with moderately wide, deep concavity, the broad points long; hind basitarsi of ♂ greatly swollen. Length, 9 to 11 mm. Much darker than the preceding, the wings more heavily clouded.

♂, Great Falls Va., June 22: ♀, Lawrence, Kans., June 18, (Curran); ♀, N. J.; ♂, Washington, Mass.; ♂, Bar Harbor, Maine, (Johnson), and those mentioned in detailed description.

Microdon ocellaris new species.

Hind basitarsi not unusually swollen. Eyes with sparse, microscopic hairs (rarely extremely difficult to see); color metallic dark green, densely punctured, the reflection not vivid; pile of head whitish to pale yellowish; of body yellowish, or greyish white; third antennal joint shorter than the first; ocellar triangle much broader than long; vertex considerably swollen; apex of scutellum with widely separated, strong spines, much as in *tristis*. Length 12 to 15 mm.

♀ Linglestown, Pa., June 14, (Champlain); ♂, Lyme, Conn., Aug. 30, 1911, (Champlain); ♂, Lyme, June 1, 1918; 2♂, Linglestown, June 3, 1919; ♂, Lyme, April 30, 1911, (all Champlain); 2♀, Darien, Conn., June 12, 1915, (Johnson); 2 ♀, Newton, Mass., May; ♂, Framingham, Mass., (Frost).

Microdon manitobensis new species.

Eyes bare; hind basitarsi not unusually swollen; first antennal joint as long as the following two; ocellar triangle a little wider than long; head and thorax yellow pilose, the latter usually with more than the posterior half bright tawny pilose, the scuttellum almost invariably so; spines of scutellum small, moderately separated. Length, 11 to 13 mm. Nearest *cothurnatus* but more robust, the tawny pile on scutellum and structural characters distinguishing it.

Fifteen specimens of both sexes, Megantic, Que., June, (Curran); Capens, Me., July 15, Oquossoc, Me., July 2 and Southwest Harbor, Me., June 22, (Johnson); 2♂2♀, Elmboro, Sask., (Jewsbury); 2♂, Ottawa, Ont., June, (Curran); several specimens, Manitoba, (Hunter). Not rare about large ant hills.

Cerioides proxima new species.

Differs from *abbreviata* Loew as follows: There is no small roundish or oval yellow spot at the outer end of the thoracal suture: the black surrounding the antennal pedicel is angulate on either side above, not rounded; the abdomen is a little more narrowed at the base.

Female, Guelph, Ont., June 8, 1923, (Curran); ♂, Orono, Me., June 26, 1917; ♂, Agr. Exp. Sta., Orono, June 16, 1915, (both Metcalf); ♂ ♀, Metagamon, Me., July 4, 1901; Bennington, Vt., June 18 (Johnson); 2♂4♀, Megantic, Que., June 12-21, 1623, (Curran); 2♀, Ottawa, Ont., May; ♀, Boucher, Saks.; ♀, Vernon, B. C., July, 2, (Ruhmann).

The genus Rhaphium as here used, includes Porphyrops and Xiphandrium.

Rhaphium subarmatum new species.

Allied to (*Leucostola*) *slossonæ* Johns. but the posterior tibiæ are wholly black; face silvery white, beard white; third antennal joint acute, three times as long as wide. Length, 6 to 6.5 mm.

♂ ♀, Oromocto, N. B., July 9, 1913, (A. B. Baird); 2♀, Franconia, N. H., 5♂1♀, same data as type pair; , ♀ Gornish, N. B., July 11, 1913.

Rhaphium gracilis new species.

Face and beard white; front bright green legs chiefly yellow, the posterior tibiæ and tarsi brown; outer genital lamellæ triangular, broad, jagged apically, the inner ones very slender, long; middle coxæ with black apical spine; arista shorter than the long, ribbon-like third antennal joint. Length, 5.5 mm.

3♂, 1♀, Beverly, Mass., May and June, (Riley Collection).

NOTES ON *PIESMA CINEREA* SAY.

By Geo. W. Barber.

Cereal and Forage Insect Investigations, U. S. Bureau of Entomology.

During the summer of 1922 *Piesma cinerea* Say was found to be very plentiful in certain sections near Boston, Mass. In Medford a plot of "Love-lies-bleeding" (*Amaranthus caudatus* L) was completely destroyed, the leaves curling and falling and even the buds of the partly grown plants being destroyed. "Prince's feather" (*Amaranthus hybridus* L., form *hypochondriacus* Robinson) and the wild *Amaranthus retroflexus* L. were also

Fig. 1. Adults of *Piesma cinerea* Say.

attacked, altho injury was not observed except for some curling of the leaves. During July, August and September all stages of the insect were found in the field.

The eggs were deposited on the under surface of the leaves where they lay on their sides, very often parallel to and near the veins, particularly the larger ones. They usually were deposited singly but in some instances there were twenty or more on a single leaf.

The nymphs fed on the under surface of the leaves, the resulting curling furnishing protection to them. New adults were usually of a light cream color tinged with green, but soon

became darker altho there was considerable variation, some remaining light, others becoming fuscous or with dark irregular patches.

The Egg.

Length .72 mm.; width .25 mm. Color uniformly light yellow; cylindrical, sides parallel; chorion bearing some 10

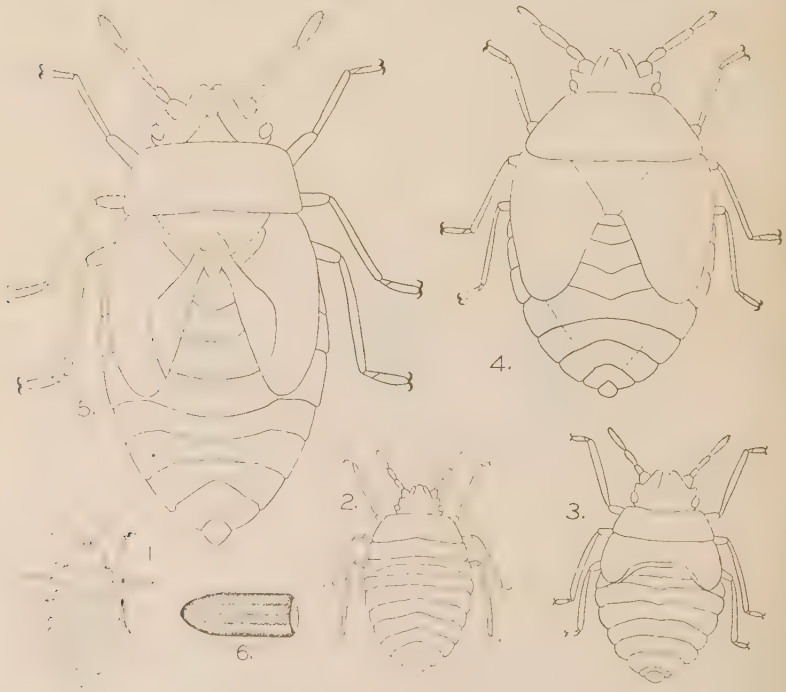


Fig. 2. Immature stages of *Piesma cinerea* Say. 1-5, first to fifth instar nymphs; 6, egg.

longitudinal ridges but little raised from the surface, the interspaces broader; end distant from the cap narrowed for about a fourth of the length into a bluntly rounding cone; scarcely narrowed to the cap which is flat, the edge bearing five very minute hemispherical chorial processes evenly spaced.

The First Instar Nymph.

Length .74 mm; width .35 mm. Color light yellow, eyes red, antennæ apically and tip of the beak somewhat brownish; body subdepressed, the sides nearly parallel; head nearly as long as wide, the protuberances before the eyes scarcely developed; antennæ as long as the head and prothorax together; eyes moderately prominent; beak reaches the middle coxæ; posterior edge of the prothorax not wider than the anterior; abdomen but little wider than the prothorax, the edges somewhat flattened; head and thorax finely and sparsely punctured.

The Second Instar Nymph.

Length .87 mm; width .53 mm. Color uniformly light yellow with a faint tinge of green; head a little wider than long, the protuberances before the eyes faintly developed; antennæ as long as the head and prothorax; thorax wider than the head, the posterior edge somewhat wider than the anterior; abdomen widest at the second segment, a little wider than the thorax, the edges flattened; head and prothorax sparsely punctate.

The Third Instar Nymph.

Length 1.16 mm; width .66 mm. Uniformly light yellow with a tinge of green, paler at the margins; head wider than long, the protuberances before the eyes bluntly developed; thorax wider than the head, the wing pads nearly attaining the anterior edge of the third abdominal segment; prothorax two and a half times as wide as long; antennæ minutely ciliate apically.

The Fourth Instar Nymph.

Length 1.75 mm; width .91 mm. Light yellow with a decided tinge of green; head wider than long, the protuberances before the eyes well developed; antennæ nearly the length of the head and prothorax, ciliate apically; prothorax nearly twice

as wide as long, posterior edge nearly twice the length of the anterior; wing pads attain the fifth abdominal segment; scutellum moderately prominent; abdomen widest at the second segment, edges thin; body sparsely punctate.

The Fifth Instar Nymph.

Length 2.5 mm; width 1.1 mm. Color light with green markings; antennæ with a brown tinge apically; prothorax with a light green area each side; abdomen light green, the edges and a quadrate area centrally placed on the third and fourth segments light, the quadrate area bordered with brown; head twice as wide as long, the protuberances before the eyes strongly developed; antennæ as long as the head and prothorax, ciliate at the apex; head narrowed behind the eyes; beak scarcely reaching the middle coxæ; prothorax rectangular, two and a half times as wide as long, the posterior margin but little longer than the anterior, marked with a faint ridge each side of the median line; scutellum prominent, triangular, wider than long; wing pads nearly reach the fifth abdominal segment; abdomen somewhat wider than the thorax, widest at the second segment; body coarsely and sparsely punctate.

NOTES ON *PIESMA CINEREA* SAY IN NEW JERSEY (HEMIPTERA).

By Harry B. Weiss and Ralph B. Lott.

New Brunswick, N. J.

This species occurs throughout New Jersey being locally common, and according to Smith (Insects of New Jersey) on horse-chestnut, under the bark of Platanus, etc. It has been mentioned frequently in literature but very little has been recorded concerning its various food plants and life history. Parshley (Canadian Entom. Feb. 1917, p. 47) mentions its occurrence in ocean drift at Beach Bluff, Mass., on June 21. Osborn and Drake (Bull. 8, vol. 11, no. 4, p. 219) state that it is common throughout Ohio under the bark of sycamore and horse-chestnut during the winter. Summers (Bull. Agric. Exp. Sta. Tennessee, vol. 4, no. 3, p. 90, 1891) has observed it "so abundant on the young leaves and flowers of grape as to do considerable damage." In the recently published "Hemiptera of Connecticut" it is listed from several localities and the statement is made that it is rather rare in the northeast. Parshley in his "Fauna of New England, Hemiptera-Heteroptera" (Occas. Papers Boston Soc. Nat. Hist., vol. 7, p. 53) gives localities in Massachusetts, Rhode Island and Connecticut. In the "Insects of Florida" by Barber (Bull. American Mus. Nat. Hist., vol. 33, Art. xxxi, pp. 495-535. 1914) it is listed from a single locality. Van Duzee (Cat. Hemip. America north of Mexico) lists it from Ontario, New York, Pennsylvania, North Carolina, Florida, Ohio, Illinois, Kansas, Colorado and California and McAtee (Bull. Brooklyn Entom. Soc., vol. 14, p. 86, 1919) summarizes its distribution as a transcontinental species by giving its range as from the state of Washington, Ontario and Massachusetts south to Texas, Florida and to Linares and Tampico, Mexico.

From the foregoing it is evident that the species is common and widely distributed. In New Jersey we have found it feeding on the flower heads of rush (*Scirpus atrovirens*) at Monmouth Junction, June 17, Bound Brook, August 9 and at Dayton, August 1, Riverton, August 9 and Moorestown, July 25 feeding

on *Amaranthus retroflexus* L., a weed commonly known as red root or pink root and sometimes very plentiful in cultivated orchards and fields.

At Moorestown, New Jersey, on July 25, where most of our observations were made, many plants of *Amaranthus retroflexus* were observed to be heavily infested with all nymphal stages and adults. Many eggs were present also. The upper leaf surfaces were mottled and spotted with white and some entire plants were almost white from top to bottom due to the combined attacks of hundreds of nymphs and adults. The injury appeared to be most severe at the tips of the plants and here the flowers and young, tender leaves hung limp and white. Eggs and empty egg shells were quite plentiful on this date. Some leaves carried as many as 18 or 20 eggs, anywhere on the lower surface and some of the flower heads were full of eggs. A few eggs were found on the upper leaf surfaces close to and parallel with the main ribs and side veins, sometimes in the axils of the veins. Others were found attached to the portions of the leaves between the side veins.

The pearly-white eggs appear to be deposited singly and fastened lightly to the leaf tissue and sides of the ribs and veins. The nymphs inhabit the lower leaf surfaces and flower heads, but the adults may occur on any portion of the plant. The nymphs are green or greenish with white markings and their color blends with that of the injured leaves. Whereas at Moorestown on July 25, many eggs and all stages were present, adults and last stage nymphs greatly outnumbered the other forms. It appeared at that time as if a new brook of adults had just gotten under way. Later in the season or on August 30, quite a few adults were present, a very few last stage nymphs and a very few eggs. Many of the adults appeared in to copulation on the flower heads.

Adult. This was described by Say (Complete Writings vol. 1, p. 349) as follows.

"*T. cinerea*—Not dilated, hemelytra with six or seven marginal spots.

Inhabits United States.

Body gray; not dilated on the margin; with much dilated punctures; head deeply bifid at tip and with a short robust spine between the eye and antennæ, basal joint spherical, abruptly smaller at base, second joint not longer than the first and less dilated; thorax with four elevated lines, obsolete behind; anterior lateral margin a little dilated; hemelytra covered, like the thorax with dilated approximate punctures, and having on the lateral margin a series of six or seven black spots; beneath grayish, more or less varied with brown; venter brownish, with spots or lines of grayish. Length to tip of hemelytra more than one-tenth of an inch. In form much resembling *T. cardui* F. It is not uncommon."

The coloration of the adult is variable and the color varieties grade into each other with one exception, this being the variety *inornata* described by McAtee (Bull. Brooklyn Entom. Soc., vol. 14, 1919) and said by him to be distinct and always separable.

MORE NOTES ON FUNGUS INSECTS AND THEIR HOSTS.[1]

By Harry B. Weiss.

New Brunswick, N. J.

Recently, Dr. George W. Martin sent me several species of beetles which he had collected on fungi in the neighborhood of Iowa City, Iowa, and they proved to be *Hister lecontei* Mars., on *Mutinus elegans*, August 11 (probably not feeding on the fungus); *Mycetophagus punctatus* Say feeding on *Polyporus radicatus*, August 11; *Mycotretus pulchra* Say on *Russula irrescens*, July 4; *Diaperis maculata* Oliv., on *Polyporus spraguei*, July and *Phenolia grossa* Fab., on *Polyporus sulphureus*, July 9.

In the Pennsylvania Department of Forestry Bulletin No. 12 (1915) Studhalter and Ruggles writing under the title, "Insects as Carriers of the Chestnut Blight Fungus" review the more important publications dealing with insects which have been considered accountable for the spread of fungi or bacteria which are saprophytic or parasitic upon plants and from their own observations, found that nineteen out of fifty-two insects collected in the field were carrying spores of *Endothia parasitica*. They concluded that some insects carried a large number of spores of the chestnut blight especially the beetle *Leptostylus macula*.

In the order Collembola, Folsom (Proc. U. S. Nat. Mus. vol. 50, p. 493) records *Achorutes armatus* Nic., as occuring commonly on agarics and on *Boletus*, *Polyporus*, *Morchella*, etc., and *Xenylla welchi* Folsom (Proc. U. S. Nat. Mus. vol. 50, p. 497) on mushroom beds in a greenhouse at Manhattan, Kansas. Alexander and McAtee (Proc. U. S. Nat. Mus. vol. 58, p. 413) state that *Limnobia triocellata* O. S., (Diptera, *Tipulidæ*) was reared from *Clytocybe* sp., and *Boletus felleus* on Plummer's Island.

Upon looking into the European literature for records of fungus insects one finds as in American literature, a general

[1]For other papers on fungus insects see Proc. Biol. Soc. Washington, vol. 33 pp. 1-20; vol. 34, pp. 59-62; pp. 85-88; pp. 167-172; vol. 35, pp. 125-128; Canadian Ent., Sept. 1922, pp. 198-199; Sept. 1923, pp. 199-201; merican Natural vol. 54, pp. 443-447.

absence of definite information concerning the specific identities of the hosts. In Calwer's Kaferbuch (1916) many species are recorded as occurring in "Locherpilzen, Wiedenschwammen, Blatterschwammen, Schleimpilzen, Buchenschwammen, Birnbaumschwammen, Staubpilzen, Schwammen, Pilzen," etc., which terms furnish little or no clue to the identity of the host. However some fifteen European species of beetles were coupled with definite host records and these are as follows:—*Agathidium seminulum* L., on *Trichia cinnaberina* (p. 289); *Saprinus lautus* Er., in faulendem *Agaricus* (p. 315); *Pocadius ferrugineus* F., in *Bovistus* (p. 439); *Mycetophagus atomarius* F., in *Sphæria deusta* (p. 500); *Sphindus dubius* Gyll., larvæ in *Reticularia hortensis*, *Lycogala miniata* (p. 502); *Asphidiphorus orbiculatus* Gyll., in Bovisten (p. 502); *Cis boleti* F., in *Polyporus versicolor*, *Boletus* sp. (p. 504); *Cis rugulosus* Mell., in *Polyporus unicolor* (p. 504); *Cis micans* F., in *Lenzites betulinus* (p. 504); *Cicones variegatus* Hellw., on *Sphæria deusta* (p. 513); *Endomychus coccineus* L., in Bovisten (p. 529); *Tetratoma Baudueri* Perr., in *Pleurotus ostreatus* (p. 771); *Hallomenus binotatus* Quens., in *Polyporus maximus* (p. 772); *H. axillaris* Ill., on *Lenzites quercicola* (p. 772); *Hypulus sericea* Sturn., in *Polyporus abietinus* (p. 775); *Diaperis boleti* L., in *Lentinus degener* (p. 807).

REMARKS ON THE PHYLOGENY AND INTERRELATIONSHIPS OF NEMATOCEROUS DIPTERA

By G. C. Crampton, Ph. D.

Massachusetts Agricultural College, Amherst, Mass.

During the course of an anatomical study of the Nematocerous Diptera, undertaken at the suggestion of Dr. C. P. Alexander, a number of interesting and important points concerning the interrelationships of these most primitive representatives of the order Diptera, were brought to light, and I would present herewith a brief resumé of the principal features suggested by this study. The accompanying diagram of the lines of

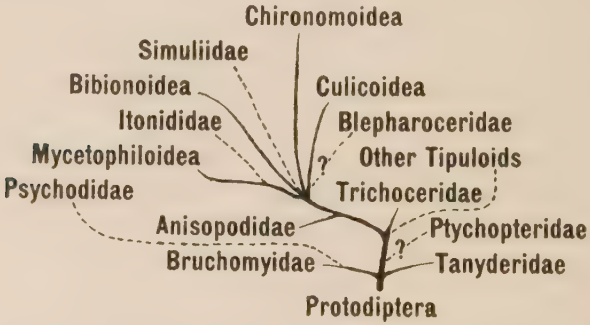


Fig. 1. Lines of descent of the Nematocerous Diptera.

descent of the Nematocerous Diptera will serve to illustrate the interrelationships here indicated.

Among the most primitive Diptera known, are the Tanyderidæ and Bruchomyidæ. Alexander, 1920, lists the Bruchomyidæ as a subfamily (Bruchomyinæ) of the Tipuloid family Tanyderidæ, but it seems preferable to raise them to family rank, since they differ from the Tanyderidæ in many important features.

The immediate ancestors of the Bruchomyidæ and Tanydreidæ evidently had a common origin—possibly in a Proto-

dipteran stem represented by such forms as *Austropsyche*, etc., described by Tillyard, 1919.

The Bruchomyidæ are very like the ancestors of the Psychodidæ, which branched off from the Bruchomyid stem to follow their own isolated path of development. On account of the isolated character of the Psychodidæ, which differ from both the Tipuloid Nematocera (Pronematocera) and non-Tipuloid Nematocera (Eunematocera) the Psychodidæ and their ancestral types, the Bruchomyidæ, might possibly be grouped together as Paranematocera, composed of the superfamily Psychodoidea but this point is of no particular importance in the present discussion.

The Tanyderidæ are among the most primitive of the Tipuloid Nematocera, and have departed but little from the ancestral Dipteran stock, but they have developed modifications of their own, and it would be impossible to derive the rest of the Tipuloid Nematocera from this family alone, although it is possible that the Tipuloid family Ptychopteridæ branched off from the ancestral Tanyderid stem, as shown in Fig. 1.

The Tipuloid subfamily Trichocerinæ of Alexander, is here raised to family rank, because the Trichoceridæ differ markedly from the Anisopodidæ (Rhyphidæ) in which family they have usually been placed. On the other hand, the Trichoceridæ are very like the ancestors of the Anisopodidæ, and apparently had a common origin with the Anisopodidæ, from which common origin they have departed less than the Anisopodidæ have. The ancestors of the Trichoceridæ arose from the common stem giving rise to the Bruchomyidæ and Tanyderidæ, and it would be impossible to derive the Trichocerids from any known Bruchomyid or Tanyderid. The rest of the Tipuloid Nematocera are of no particular interest in the study of the lines of development of the non-Tipuloid Nematocera, and need not be further considered here.

The Anisopodidæ (Ryphidæ) furnish the "key" group in tracing the phylogeny of the non-Tipuloid Nematocera, and it is a question as to whether the Anisopodidæ are still to be considered as true Tipuloid Nematocera, or whether they have progressed far enough toward the non-Tipuloid Nematocera

to be classed with the latter. At any rate, the Anisopodidæ are extremely close to the actual ancestors of the non-Tipuloid Nematocera, which were possibly of some "post-Anisopodid," but "pre-Mycetophilid" type intermediate between the Anisopodidæ and Mycetophilidæ.

The Mycetophiloidea (i. e. Mycetophilidæ, Mycetobiidæ, Sciaridæ, etc.) arose from the Anisopodidæ themselves, or from forms extremely like the Anisopodidæ, and it is extremely difficult to determine whether to group such annectant types as the Mycetobiidæ with the Mycetophilidæ, or with the Anisopodidæ. I have raised the subfamily Mycetobiinæ of Edwards, to the rank of a family, and have placed it among the Mycetophiloidea next to the Mycetophilidæ, rather than to include the Mycetobiinæ in the family Anisopodidæ as Edwards does.

The Sciaridæ are rather primitive Mycetophiloids worthy of family rank, but I do not think that Malloch is justified in raising the Mycetophilid subfamily Platyurinæ to family rank, and there is even some question of the advisability of raising the Bolitophilinæ to family rank.

The Itonididæ (Cecidomyidæ) might be included among the Mycetophiloidea. At any rate, they arose from the Anisopodid-like ancestors of the Mycetophiloids, and their line of development parallels that of the Mycetophiloidea remarkably closely, so that there can be no doubt that their closest relatives are the Mycetophiloids.

The Bibionoidea include the Bibionidæ, Scatopsidæ, etc., and the Simuliidæ may possibly be grouped in this superfamily also. The Bibionoidea are very closely related to the Mycetophiloidea, and apparently arose from the Anisopodid-like ancestors of the Mycetophiloidea.

The genus *Hesperinus* (and *Hesperodes* also) has been much shuffled about, having been placed in the family Bibionidæ by some, in the family Mycetophilidæ by others, and *Hesperinus* has even been placed in a separate family, the Pachyneuridæ, by certain European entomologists. *Hesperinus*, however, is so closely related to the Bibionid genus *Plecia*, that if *Plecia*

is retained in the family Bibionidæ, then *Hesperinus* must be retained in the Bibionidæ also.

The Simuliidæ are extremely closely related to the Chironomoid family Ceratopogonidæ, and apparently represent a connecting group annectant between the Chironomoidea and Bibionoidea, with some suggestions of affinities with the Culicoidea. The Simuliidæ apparently branched off at or near the base of the Bibionoid stem.

The Chironomoidea include the Chironomidæ and Ceratopogonidæ, and possibly the Thaumaleidæ (Orphnephilidæ) also. The Ceratopogonidæ branched off from the base of the Chironomoid stem, and have retained many characters suggestive of affinities with the Simuliidæ and with the Culicoidea also. The Chironomoidea are so closely related to the Culicoidea that it might be preferable to include them in the superfamily Culicoidea, but for the sake of convenience, the Chironomoidea have been treated as a distinct superfamily in the phylogenetic tree shown in Fig. 1.

The Culicoidea include the Dixidæ, Culicidæ, and Chaoroboridæ, the latter being usually regarded as a Culicid subfamily, the Chaoborinæ (Corethrinæ). The Dixidæ appear to be very close to the ancestral stock from which the Culicidæ and Chaoroboridæ were derived. The Culicoidea and their close relatives, the Chironomoidea, were apparently derived from ancestors very closely allied to the Anisopodid-like ancestors of the Bibionoidea and Mycetophiloidea, so that these Anisopodid-like forms were the types from which the Mycetophiloids, Bibionoids, Chironomoids and Culicoids were derived.

The Blepharoceroidea, containing the single family Blepharoceridæ, represent an extremely isolated "compact" group whose affinities are very difficult to determine. Of the three Blepharocerid subfamilies Edwardsininæ, Blepharocerinæ, and Deuterophlebinæ, the Edwardsininæ, represented by the genus *Edwardsina,* are the most primitive; but even with the help of *Edwardsina,* it is practically impossible to determine the closest affinities of the Blepharoceridæ, for despite *Edwardsina's* primitiveness, it is extremely isolated, and is not approached at all closely by any Nematocera I have seen. I find in the Blepha-

roceridæ some slight indications of affinities with the Bibionoidea, and also some slight suggestions of resemblances to the Chironomoidea and Culicoidea. The mouthparts of *Edwardsina* resemble those of the Tanyderidæ, and Dr. Alexander finds suggestions of affinities with the Tanyderids in the wings of *Edwardsina*; but the other structures of Edwardsina show no marked resemblance to the Tanyderids, so that it is preferable to group the Blepharocerids with the non-Tipuloid Nematocera provisionally, leaving the matter of their closer affinities until more data on the subject is available.

In brief, the Culicoidea, Chironomoidea, Bibionoidea and Mycetophiloidea were apparently descended from Anisopodid-like ancestors, which in turn lead to the ancestral Trichoceridæ. These were derived from ancestors like those of the Bruchomyidæ and Tanyderidæ, which sprang from the common Protodipteran stem, represented by such forms as the fossil Protodipteron *Austropsyche*. The latter is extremely Mecopteroid in nature, and beyond a doubt the Protodiptera arose from the Mecoptera themselves, or from the immediate ancestors of the Mecoptera, and the Trichoptera also arose from the same stock. These lines of development are joined by those of the Hymenoptera and Neuroptera as we trace them back to their ultimate source in the Protorthoptera, or in the common Protorthopteran-Protoblattid stem from which the insects above the Palædicyoptera (i. e., the "Neopterygota") were derived. These in turn lead to the Palæodictyoptera, and the Palæodictyoptera together with the Odonotoids and Ephemeroids (*i. e.*, the "Archipterygota"), were apparently derived from the Lepismatoid ancestors of the Pterygota in general.

A NEW BEE FROM OREGON.

By T. D. A. Cockerell.

University of Colorado.

Halictoides crassipes sp. nov.

♂. Length about 10.5 mm; black, with much long brownish-black hair, becoming paler on tubercles and sides of metathorax, and some white hair along hind margin of posterior tibiæ; tegulæ dark brown; wings dilute fuliginous. Closely related to *H. maurus* (Cresson), to which it exactly runs in my table in Ent. News, Feb. 1916, but easily separated thus: larger; lower margin of clypeus concave: flagellum considerably longer, and bright ferruginous beneath; second cubital cell much longer, more produced apically, and receiving first recurrent nervure near base; wings browner; hind femora much more massive. The fifth abdominal segment presents a broad emarginate shining ferruginous plate.

Albany, Oregon (*Holleman*; Peabody Academy). Type in Museum of Comparative Zoology, Harvard University.

Halictoides is a Holarctic genus which is much better represented in North America than in the Old World. Even in the Old World, most of the species are Asiatic, coming from Turkestan, Mongolia and China. The closely allied *Dufourea*[1] is confined to the Old World, extending from China to Egypt and Spain, with one species (*D. calidula* Ckll) in tropical Africa. Friese has described a species from Mongolia. We may surmise that *Halictoides* had its origin in America, *Dufourea* in the Palæarctic region. In addition to the characters of venation and antennæ cited by authors to distinguish *Dufourea* from *Halictoides*, the following peculiarities of the mouth-parts may be used to separate the type species of *Halictoides* from *Dufourea.*

[1]*Dufourea* Lapeletier, 1841; not *Dufouria* Desvoidy, 1830.

1. *Halictoides dentiventris* Nyl. Labial palpi with first joint longer than the other three together, second shortest; maxillary palpi with first two joints stout, galea reaching to about middle of fourth joint.
2. *Dufourea vulgaris* Schenck. Labial palpi with first joint about as long as 2+3; maxillary palpi with first three joints stout, galea reaching a little beyond middle of third.

However *Halictoides paradoxus* Morawitz (Switzerland) has the first joint of labial palpi thickened beyond the middle (as in the Californian *H. virgatus* Ckll), and not nearly so long in proportion to second as in *H. dentiventris*. It has the first four joints of maxillary palpi stout, the galea reaching about middle of third.

H. virgatus has the second joint of labial palpi very long, nearly as long as first, thus differing conspicuously from *H. paradoxus*. In *H. virgatus* the mandibles are simple; in *H. campanulæ* Ckll., *H. tinsleyi* Ckll., *Dufourea vulgaris*, etc., and they have a conspicuous inner tooth. The labrum of *H. campanulæ* is much shorter in proportion to its width than in *H. virgatus*, and also differs in having prominent lateral corners. The general outcome of these and other studies is that *Halictoides* can be taken in a broad sense as including very diverse forms; or it can be divided into numerous genera, for which quite a series of names is already available. Probably the best method is to treat the divisions as subgenera; accordingly *H. paradoxus* may be taken as the type of a new subgenus *Cephalictoides*, nov., most obviously differing from *Parahalictoides* in the shape of the head. For other details see Ann. Mag. Nat. Hist., Dec. 1899, p. 420.

PROCEEDINGS OF THE CAMBRIDGE ENTOMOLOGICAL CLUB.

The annual meeting was held January 8, 1924. The secretary's report showed that 10 meetings were held during the year with average attendance of 14.5 continuing the gradual decrease since 1920 when it was 22.5. Two members were elected and the whole number of members is 73. The editor's report showed that volume 30 of Psyche just completed contains 235 pages. During the war the number was reduced to 139 pages in 1918 since which there has been a gradual increase. The following officers were elected, President C. T. Brues, Vice President R. Heber Howe, Secretary J. H. Emerton, Treasurer Fred H. Walker, Editor C. T. Brues. Executive Committee A. P. Morse, S. W. Denton, S. M. Dohanian.

Mr. A. P. Morse retiring from the presidency read a paper on Insect Music in English Literature.

This meeting being the 50th anniversary of the founding of the Club, J. H. Emerton one of the original members read a paper on its early history which is published in Psyche for February 1924. W. L. W. Field followed with an account of the Harris Club which was organized in Boston in 1899 and merged with the Cambridge Club in 1903.

At the meeting of February 12, Mr. C. W. Johnson explained his system of noting localities in New England where insects have been collected. The area is divided into some thirty districts numbered serially beginning at the north. In cataloguing only the numbers are used or where a district has to be divided the number with a letter added.

At the meeting of March 11, Prof. Brues read a paper on certain Phoridæ, minute Diptera many of them without wings. Originally found in the tropics, several species of this type have later been discovered in northern localities and on snow in winter. Prof. W. M. Wheeler read a paper on the Bullhorn Acacias which have enormous thorns in pairs at the base of the leaves. Ants perforate these thorns while they are green, eat out the pith and use them as habitations. See Psyche April 1924. Mr. J. H.

Emerton showed by maps the distribution of several northern New England Spiders.

At the April meeting Prof. Wheeler read a paper on Dipterous larvæ, allied to Microdon, found in ants' nests in Panama and British Guiana. Mr. Emerton showed lantern photographs of the tracks of insects on sand at the Ipswich sand-dunes. Dr. Smulyan read a paper on the eating caterpillars of the "fall web-worm" by yellow-jacket wasps. See Psyche June-August 1924.

At the meeting of May 13 Prof. Brues read a paper on the Insects of the warm springs of Yellowstone Park. Prof. Wheeler showed an ant *Tetramorium guineense* in which the head has all the characters of a male and the rest of the body those of a female. See Psyche June-August 1924. Mr. C. W. Johnson read a list of the families of Diptera of New England now amounting to 3170 species.

A special meeting of the Club was held on Tuesday evening May 27, 1924 to meet Mr. E. A. Schwarz now of the National Museum at Washington who was one of the original members of the Club. Refreshments were served and reminiscences of early members discussed.

At the meeting of June 10, 1924 Dr. Joseph Bequaert told about a visit to Honduras to investigate the midges at a station of the United Fruit Co. Dr. Bequaert made observations on the mosquitoes, Tabanidæ and other insects. With this meeting the Club adjourned for the summer.

J. H. Emerton,
Secretary.

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CAMBRIDGE ENTOMOLOGICAL CLUB

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